Back Numbers of the Proceedings.

New members may not be aware that it is possible to obtain copies of most numbers of the Proceedings of the Society since 1908. There is also available an index to the Proceedings from 1903 to 1923 (price 1/-).

These back numbers contain much valuable material dealing with the archaeology, history and natural history of Hants and Dorset, and reference to the index is well worth while to all who are interested in these subjects.

Many of the articles and lectures are well illustrated, and some of them contain studies which are not available elsewhere.

The Secretary will be pleased to supply further information to any members desiring it.

BRITISH MUSEUM NATURAL HISTORY
PRESENTED
19 FEB 1952

PRESENTED
3 MAR 1953

PROCEEDINGS
OF THE

Bournemouth Natural Science Society

VOL. XLII

SESSION 1951-52

Price - Five Shillings

BRITISH MUSEUM
NATURAL HISTORY

PROCEEDINGS of the

Bournemouth Natural Science Society

VOL. XLII.
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PUBLISHED BY THE SOCIETY AT ITS HOUSE,
39, CHRISTCHURCH ROAD, BOURNEMOUTH, 1953.

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Introductory Note

The objects of the Society are declared in the second of its Rules to be "the promotion of the study of Science in all its branches, and of Public Education, by means of Lectures, Field Meetings, the reading and discussion of Papers, and in any way that the Council of the Society shall deem advisable."

The branches of Science at present represented are as follows:—**Archaeology and History, Astronomy, Botany, Entomology, Geography, Geology, Microscopy, Photography, Physics and Chemistry, and Zoology.**

During the **Winter Session,** from October to April, frequent meetings are held, comprising Lectures on subjects of scientific interest, illustrated by lantern slides, films, epidiascope, diagrams, specimens, and experiments.

Throughout the **Summer Session,** Field Meetings on an average of two or three a week, are held in suitable places in the neighbourhood of the town, or Coach Tours are arranged to districts of scientific interest at a distance.

The management of the Society is vested in a Council, which is elected at the Annual General Meeting.

The Society possesses a Library available for the use of members. Books may be borrowed by members, and there is a Reading Room in which works of reference may be consulted. The Museum contains many valuable scientific collections and specimens. The Library and the Museum serve to illustrate and illuminate the ten Sections of the Society. There is a well-equipped Dark Room for the use of members interested in Photography. The house stands in a pleasant garden of over an acre.

Members are elected by the Council, and pay an annual subscription of £1 10s. 0d. for full membership, or £15 for Life Membership. An Entrance Fee of 5/- is payable upon nomination for election. The Family Subscription (for members of a family living in the same house) is as follows:—First Adult Member, £1 10s. 0d.; Second Adult Member, £1; each additional Adult Member, 10/-; Children between 12 and 18 years, 10/- (Associate Members). Members living six miles or more from the Square pay half the above rates. Renewable monthly membership, 5/-, is available.

A bi-monthly Programme, giving full details of all meetings, is posted to every member, and a Volume of Proceedings is published annually, of which adult members receive a copy.

Application Forms for Membership and further particulars may be obtained from the Honorary Assistant Secretary,
Miss D. M. LOWTHER, B.Sc.,
Lonsdale, Mayfield Avenue,
Parkstone, Dorset.
(Tel. Parkstone 1219)

Bournemouth Natural Science Society

OFFICERS AND COUNCIL FOR 1952-53.

N.B.—University and other qualifications are only attached at first mention of names.

President

F. Williamson, F.R.Hist.S.

Chairman of Council

H. E. Clarke, M.A., B.Sc., F.R.I.C.

Deputy Chairman of Council

W. J. Read, M.Sc., F.R.I.C.

Council

The Officers and Chairmen of Sections (*ex-officio*).

Miss E. Banham
Mrs. E. Brimicombe
Henry Bury, M.A., F.G.S., F.L.S.
Emer. Prof. John Cameron, M.D., D.Sc.
Major C. L. Cooper-Hunt, M.A., Ps.D.
B. Gorton, M.R.C.V.S.
H. W. Leonard
H. C. Mayo
F. Ogden
H. G. Sadler
Miss I. E. Sheffield
W. G. Smith
H. K. Stanton
Mrs. W. Boyd Watt, F.Z.S., M.B.O.U.

Chairmen of Sections

Archaeology and History : F. Williamson.
Astronomy : W. P. Winter, B.Sc.
Botany : E. Chambers, F.L.S.
Entomology : W. S. I. Cox, F.R.E.S.
Geography : H. de Castro.
Geology : D. A. Wray, M.Sc., Ph.D., F.G.S.
Microscopy : J. H. Murgatroyd, F.L.S., F.Z.S., F.R.E.S.
Photography : A. W. Legat, M.Inst.C.E.
Physical and Chemical : H. E. Clarke.
Zoology : V. du B. Smythe, F.R.N.S.

Hon. Treasurer

W. J. Woodhouse, A.C.P., M.I.H.
29, Twynham Road, Southbourne (Tel. : Southbourne 44880).

Secretaries

Hon. Secretary : W. S. Brown, B.Sc.
Hon. Assistant Secretary : Miss D. M. Lowther, B.Sc.
Hon. Assist. Secretary (Programmes) : H. W. Leonard.

Hon. Librarian

A. A. Foyle.

Hon. Curator

F. Williamson.

Hon. Editor

F. Coleman, M.C., M.R.C.S., F.D.S.

Hon Auditors

F. Williamson, A. A. Foyle.

Hon. Solicitor

G. A. Turner.

Bankers

National Provincial Bank of England, Bournemouth.

COMMITTEES, 1952-53.

Finance and General Purposes:

Chairman : H. E. CLARKE.

Hon. Treasurer : W. J. WOODHOUSE. *Hon. Secretary* : W. S. BROWN.
H. BURY, J. CAMERON, E. CHAMBERS, F. OGDEN, W. J. READ, S. WHITAKER.

Library:

Chairman : W. S. BROWN.

A. A. FOYLE, H. E. CLARKE, MRS. W. PERCEVAL, W. J. READ, H. G. SADLER, F. WILLIAMSON.

Museum:

Chairman : F. WILLIAMSON.

E. CHAMBERS, H. E. CLARKE, W. S. I. COX, H. DE CASTRO, A. W. LEGAT, J. H. MURGATROYD, MRS. W. BOYD WATT, W. P. WINTER, D. A. WRAY.

Editorial:

Chairman : F. COLEMAN.

W. S. BROWN, H. BURY, E. CHAMBERS, H. E. CLARKE, W. J. READ, W. J. WOODHOUSE.

Garden:

Chairman : H. G. SADLER.

MRS. W. CHOMÉ, MISS E. WHITAKER, F. COLEMAN, H. W. LEONARD, ST. J. K. NORTH-ROW.

Entertainment:

Chairman : E. CHAMBERS.

H. E. CLARKE, H. G. SADLER, MISS I. SHEFFIELD, F. WILLIAMSON.

Bournemouth Natural Science Society

List of Members.

(*Revised to December* 14*th*, 1952)

*HONORARY MEMBER.
oORIGINAL MEMBER.
vVICE-PRESIDENT.
wGILBERT WHITE FELLOWSHIP
†PAST PRESIDENT.
lLIFE MEMBER.
aASSOCIATE MEMBER.

The year of election is given before the name of each member.

1951	Abley, Miss M.	Portreath, Merly, Wimborne
1952	Adam, Miss A. T.	17 Linwood Road
1947	Alabaster, Sir G., KT., O.B.E., K.C.	34 Pinecliffe Avenue, Southbourne
1947	Alcock, J. W.	24a Ovington Avenue, Iford
1948	Alcock, Mrs. A.	,, ,,
1948	Alcock, Miss J.	,, ,,
1948	Alcock, Miss M.	,, ,,
1946	Allan, Miss M. W.	6 St. Alban's Crescent
1951	Angus-Hay, Mrs. L. E.	9 Windermere Road
1943	Appleton, Miss M.	8 Cavendish Place
1950	Armfield, Mrs. G. M.	Oak Tree House, Hightown, Ringwood
1951	Atkin, Miss M. G., M.CH.S.	Lindale, 64 Wimborne Road
1952	Atkinson, Mrs. A., S.R.N.	40 Palmer Road, Oakdale, Poole
1948	Austin, Mrs. G.	Devon Towers, Westcliff Road
1950	Bailey, J. H.	39 Strouden Avenue
1950	Bailey, Mrs. A.	,,
1951	wBailey, Miss A. R.	Cressex Lodge, Binfield, Bracknell, Berks.
1950	Bain, Miss E. M .	15 Clarendon Road, Bournemouth West
1947	Ball, Miss W.	27 Heatherlea Road, Southbourne
1936	Banham, Miss E.	Newton Morell, Munster Road, Parkstone
1951	Barker, W., B.SC.	Tide Brook, Upton Road, Poole
1951	Barker, Mrs. E.	,, ,,
1912	aBarraclough, A., M.A., F.R.G.S.	93 East Avenue
1951	Barrough, W.	Macomb Croft, 9 Florence Road, Boscombe
1952	aBeale, Master A. J.	44 Glenferness Avenue
1952	aBeale, Master P. B.	,, ,,
1949	Beale, J. M., M.A.	,, ,,
1949	Beale, Mrs. M.	,, ,,
1951	aBeasley, D. J.	5 Leeson Road, Queen's Park
1952	Beaumont, Miss E. J.	17 Ravenscourt Road
1944	Bell, T. M., B.A., M.B., B.CH., M.R.C.S., L.R.C.P.	255 Belle Vue Road, Southbourne
1941	Bell, Mrs. R. M.	,, ,,
1942	Bennett, Miss D.	Martello Firs, Martello Road, Branksome Park
1942	Bennett, Miss M.	,, ,,
1920	Bennett, Risdon, M.A.	Yew Tree Cottage, Broadstone
1950	Benwell, Miss P.	2 Woodland Way, Bearway
1947	Berrill, Miss M. E.	Heathlands Hotel, Grove Road
1942	Bickel, T. H.	Flat 1, 31 Marlborough Road

1947	Binks, Miss I.	9 Florence Road
1951	wBlack, Mrs. E.	69 Grosvenor Street, London, W.1
1946	Blackmore, H. C., L.D.S., R.C.S.	7 Browning Avenue, Boscombe
1948	Blake, Mrs. N. D.	The Elms, Wheelers Lane, Knighton, Wimborne
1950	Bland, R.	Kinston, Central Avenue, Corfe Mullen
1950	Bland, Mrs. S.	,, ,,
1942	Boardman, E.	The Datcha, Compton Drive, Parkstone
1950	Bone, Miss M. R. M.	Ardoyne, 19 Cavendish Road
1944	Borrett, A. C.	12 Montague Road, W. Southbourne
1944	Borrett, Mrs. L.	,, ,,
1938	Bottomley, Dr. F. C.	1 Beechwood Avenue, Boscombe
1947	Bowkett, Miss N.	54 Westby Road, Boscombe
1952	Bowring, Miss M.	36 Holdenhurst Avenue
1948	Brett, Mrs. A.	58 Wellington Road
1942	Brimicombe, Mrs. E.	32 Ken Road, Southbourne
1926	*Broad, F., F.S.I.	Manton Villa, 2 Oxford Road
1921	Bromley, Miss	81 Lansdowne Road
1937	Brown, S. C. S., L.D.S., R.C.S., H.D.D.	454 Christchurch Road, Boscombe
1950	aBrown, C.	,, ,,
1951	aBrown, D. C.	142 Richmond Park Road
1948	Brown, W. S., B.SC.	Three Ways, Dudsbury, Wimborne
1952	Browning, Miss I. G.	12 Wimborne Road
1952	Browning, Miss K. L.	,, ,,
1920	Brumell, Miss M.	7 Windermere Road
1946	Brummitt, Miss G.	Elderly Nurses' Home, Holdenhurst
1951	wBull, A. W. M.	Broom House, Chiltern Road, Hitchin
1937	Burrow, Mrs. D. M., PH.D., B.SC.	107 Alumhurst Road
1922	Burton, E. St. J., F.G.S., F.R.S.A.	St. Anne's, Seaward Avenue, Barton-on-Sea
1922*†v	Bury, Henry, M.A., F.L.S., F.G.S.	The Gate House, 17 Alumdale Road
1930	Bury, Miss G. J.	,, ,,
1946	Busby, Miss G.	4 Harbour Close, West Road, Canford Cliffs
1952	Butcher, A. J., F.R.I.B.A.	Boldine, Golf Links Road, Ferndown
1945	Butler, G. W.	Old Park Farm, Lytchett Matravers
1947	Butterworth, J. F.	2 Forest Road, Branksome Park
1948	Butterworth, E. P.	,, ,,

1928	LCalkin, J. B., M.A., F.S.A.	Virginia House, Langton Matravers
1950	Calladine, Miss D.	23 William Road, Queen's Park
1934	†vCameron, J., M.D., D.SC.	63 Grove Road
1951	Campion, Miss A.	11 New Park Road, Southbourne
1939*†v	Carpenter, Prof. G. D. Hale, M.B.E., D.M., F.L.S., F.Z.S.	Penguelle, Cumnor Hill, Oxford
1949	Carter, Miss E., M.A.	20 Marlborough Road
1950	Cashmore, Group-Capt. E. M.	Windrush, Whitehouse Hill, Wimborne
1950	Cashmore, Mrs. A.	,, ,,
1944	†vChambers, Ernest, F.L.S.	39a Queen's Park South Drive
1950	Chambers, Mrs.	,, ,,
1948	Chambers, Miss V.	29 Watcombe Road, Southbourne
1946	Chapiin, W. A.	11 Folkestone Road, Harnham, Salisbury
1951	wChase, Miss E.	Brooklyn, Massachusetts, U.S.A.
1945	Cheesman, Mrs. A.	The Ken, Walkford, Christchurch
1945	Child, Miss L. M.	37 Sunnyhill Road, W. Southbourne
1912	Chilver, Miss K. M.	2 Shaftesbury Road

1951	Chomé, E. E. P.	6 Alyth Road
1942	Chomé, Mrs. W.	,,
1943	Chomé, Miss E.	,,
1943	Chomé, Miss M.	,,
1950	Churches, Mrs. E. W., M.B., CH.B.	The White House, Colebrook Street, Winchester
1931	Clark, Miss K. E.	15a St. Mary's Road
1945	Clarke, H. E., M.A., B.SC., F.R.I.C.	64b Surrey Road
1945	Clarke, Mrs. M.	,,
1927	*Clay, R. C. C., M.D., F.S.A.	The Manor House, Fovant, Wilts.
1950	Clifford, Miss E. E.	14 Stourcliffe Avenue, Bournemouth
1951	Coe, Mrs. G.	3 Dunbar Road
1946	Cohen, E., F.Z.S., M.B.O.U.	Hazelhurst, Sway
1951	Coleman, F., M.C., M.R.C.S., F.D.S.	Empress Hotel, Exeter Road
1941	Coltar, Miss S. A.	98 The Grove, Redhill Park, Moordown
1926	Cooper, H. A.	White Lodge, 8 Oban Road
1941	Cooper, Mrs. E. M.	,, ,,
1951	LCooper, Miss R. I.	,, ,,
1945	Cooper-Hunt, Major C. L., M.A., PS.D., MS.D., D.D.	19 Marine Drive East, Barton-on-Sea
1945	Cooper-Hunt, Mrs. E.	,, ,,
1950	Cornish, Mrs. R.	37 Belvedere Road
1952	Corser, Miss G. M.	8 Redhill Crescent, Moordown
1951	Courtney, F. E.	Municipal College of Art, Bournemouth
1951	ACox, N. R.	3 St. Paul's Road
1948	Cox, W. S. I., F.R.E.S.	248 Castle Lane
1948	Cox, Mrs.	,,
1922	Crallan, Mrs.	Lansdowne Hotel, Eastbourne
1948	Crawshaw, J. C., A.R.C.O.	Latchmoor Cottage, Riverway, Christchurch
1949	Crawshaw, Mrs.	,, ,,
1941	Cresswell, Mrs. S. M.	13 Cecil Court, Charminster Road
1952	ACritchley, Master R. C.	Knole Lodge, 39 Knyveton Road
1950	Cundall, H. L.	105 Hennings Park Road, Poole
1950	Cundall, Mrs. M.	,, ,,
1931	Curgenven, Miss A. J.	Cavendish Nursing Home, 51 Braidley Road
1903	*oCurtis, W. Parkinson, F.E.S.	Ladywell Cottage, Tower Road, Branksome Park

1947	d'Aguilar, Lt.-Col. C. B.	Pavilion Hotel, Bath Road
1940	Dailey, Miss K.	134 Western Avenue, Ensbury Park
1951	Dane, A., B.SC.	64 R. L. Stevenson Avenue, Bournemouth, W.
1950	Davidson, Miss M. S., M.A., B.SC.	Bournemouth School for Girls, Gervis Road
1951	Davis, Miss G. H.	Moorlands, The Grove, Ferndown
1949	Day, J.	60 Brackendale Road
1952	Day, Mrs. E. T.	60 Brackendale Road
1930	de Castro, H.	Yarlington, Springdale Avenue, Broadstone
1945	de Jersey, Mrs. D.	98 Pauntley Road, Mudeford, Christchurch
1951	Dennis, Rev. N., S.J.	The Presbytery, Albert Road
1935	Derry, Mrs. E. H.	Charnwood, Belle Vue Road, Southbourne
1947	Dewdney, H. A., F.R.C.O., L.R.A.M.	15 Wellington Road
1950	Dixey, Mrs. A. D.	36 Southern Road, West Southbourne
1949	Dixon, Miss H.	62 Christchurch Road

1943	Dodd, Mrs. R.	140 Richmond Park Road
1950	Down, E. A., F.R.I.C.S., F.F.A.S., M.INST.R.A.	47 Boscombe Overcliff Drive
1950	Down, Mrs. Dorothy I. A.	,, ,,
1950	Down, Peter A.	,, ,,
1950	Down, Miss Rosemary J.	,, ,,
1950	aDown, Miss Daphne V.	,, ,,
1950	Downe, R. F. H.	67 Portchester Road
1952	Dransfield, D. C.	27 Lombard Avenue, Southbourne
1952	Dransfield, Mrs. B. J.	,, ,,
1949	Drayton, Miss A. W.	7 Watkin Road, Boscombe
1946	Drew, Lt.-Col. C. D., D.S.O., F.S.A.	Dorset County Museum, Dorchester
1950	Dunn, Addison H.	Baycroft, Central Avenue, Corfe Mullen, Wimborne
1950	Dunn, Mrs. B. R.	,, ,,
1950	aDunn, Miss P. L.	,, ,,
1951	Dunton, Miss W. M.	Lyndhurst, East Green, Southwold, Suffolk
1952	Dymock, J. W.	1 Ashley Drive, Ashley Heath, Ringwood

1952	Eaton, Miss I.	15 Spur Hill Avenue, Parkstone, Dorset
1936	Edwards, Charles, M.D.	Lyndon Lodge, 51b Christchurch Road
1936	Edwards, Mrs. H.	,, ,,
1946	Ellison, Prof. F. O'B., M.D., F.R.A.S.	Pine Apple Cottage, Burton
1951	Elmes, J. P., B.A.	23 Cassel Avenue, Bournemouth, W.
1950	Evans, Mrs. E. E. M., B.A.	113 Western Avenue, Ensbury Park

1951	wFarish, Mrs. J. J.	42 London Lane, Bromley, Kent
1919	Farmar, Mrs. K. A.	Whitton Lodge, Stevenson Crescent, Parkstone
1922	Farmar, Miss E. A.	,, ,,
1952	Fenton, Mrs. O.	41 Grand Avenue, Southbourne
1934	Finnis, Miss F. M.	15 Julian's Road, Wimborne
1951	Firth, Miss M. L.	2 Donoughmore Road, Boscombe
1951	wFisher, J.	Address unknown
1950	Fisher, Miss N. K.	3a Alumhurst Road, Bournemouth, W.
1947	Fletcher, Capt. G.	Avon, Chine Crescent Road
1950	Fletcher, Mrs. V.	,, ,,
1952	Flood-Page, Miss	Keverstone Court Hotel, Manor Road
1942	Ford, Miss C.	13 Beaufort Road, W. Southbourne
1938	Ford, J. C.	3 Harvey Road, Boscombe
1937	Forrest, Miss C. D.	Hiproof, Benellen Road
1925	Fountain, E. D., L.R.C.P., M.R.C.S.	Vron, 30 Mansfield Road, Parkstone
1952	Foulston, Mrs. G. W.	21a Wayside Road, Southbourne
1945	Foyle, A. A.	24 R. L. Stevenson Avenue
1948	Francis, Miss E.	Beverley, Barton Lane, Barton-on-Sea
1952	Francis, Miss E. G.	,, ,,
1949	Francis, Miss E., B.A.	Thrupp Lane, Stroud

1952	Gay, Miss P. M.	64, Pine Grange, Bath Road
1950	Geer, Miss M. L.	Fircroft Hotel, Owls Road, Boscombe
1952	Genge, G. F. S., M.B., B.S., M.R.C.S., L.R.C.P.	Neville House, 32 Alum Chine Road
1951	Goddard, Miss E. F.	Allendale, 215 Holdenhurst Road

1947	Gompel, Mrs. M.	12 Chigwell Road
1949	Goodhart, Mrs. M.	West Thorpe, Lymington
1942	Gorringe, Miss K.	11 Branksome Dene Road, Westbourne
1927	Gorton, B., M.R.C.V.S.	22 Arnewood Road, West Southbourne
1951	wGourlay, W. B.	7 Millington Road, Cambridge
1950	Graham, Miss S. F., B.SC.	Bournemouth School for Girls, Gervis Road
1948	Grant, Col. T. H.	B35 San Remo Towers, Boscombe
1948	Grant, Mrs. F.	,, ,,
1951	Grantham, Miss W. A.	38 Clifton Road, Parkstone, Dorset
1950	Green, E. C., B.A., F.L.S.	Arne Sea, Brudenell Avenue, Canford Cliffs
1947	Green, Miss F. W., M.A.O.T.	16 Warnford Road, Boscombe, E.
1944	Greg, Mrs. F.	9 Hengist Road, Boscombe
1952	Gregory, A. W., A.M.I.E.E., F.R.G.S.	25 Glenmoor Road, Winton
1948	Griffin, J., M.A.	20 St. Ledger's Road
1948	Griffin, J. A.	,, ,,
1951	Griffiths, Miss D.	15 Wimborne Road
1951	Griffiths, Miss V. M.	,, ,,
1941	Gwyther, W. T.	12 Foxholes Road, Southbourne
1931	Haines, Mrs. E. M.	Appleslade, Ringwood, Hants
1951	Haines, Miss G. M.	,, ,,
1951	Haines, Miss R. M.	,, ,,
1929	LHaines, G. E.	602 Christchurch Road
1951	Hanbury, Miss O. T.	Moorlands, The Grove, Ferndown
1945	Harding, Mrs. L.	85b Southbourne Grove
1948	Harding, W. G.	,, ,,
1951	Harding, R.	3 Portchester Road
1952	Hardinge, C. H. N.	26 Egerton Road
1952	Hardy, P., F.R.I.B.A.	124 Old Christchurch Road
1951	Harlock, Miss M. L.	44 Heather View Road, Branksome
1932	*Hatton, Mrs.	Dutch House, Cliff Road, Barton-on-Sea
1920	Hawes, Miss.	The Moorings, 27 Nelson Road
1951	Hawker, Mrs. E.	25 Burnaby Road, Bournemouth, W.
1949	Hayley, Miss V. G.	Sandykeld Hall, Manor Road
1951	Hayman, Mrs. M. S.	38 Queen's Park South Drive
1951	Henderson, J. G.	Tower House, Westcliff Gardens
1928	Henderson, R. G., M.A., M.B., CH.B. (Aber.), F.R.C.S. (Edin.)	87a Southbourne Road
1951	Hewer, Mrs. K. B.	Sandykeld Hall Hotel, Manor Road
1952	Hibberd, Mrs. A. A.	13 Lombard Avenue
1952	Hill, S. A., M.I.MECH.I.	Hillside, Elgin Road, Parkstone, Dorset
1952	Hill, Mrs. E. S.	,, ,,
1952	Hilton, Miss D.	East Dyke, Higher Clovelly, Bideford
1946	Hilton-Johnson, Miss C.	12 Oban Road
1948	Hodgson, W. H.	3 Coy Pond Road
1952	Holroyd, G.	Wheaton Lodge Hotel, 16 Branksome Wood Road
1950	Hook, Oliver, F.Z.S.	Brackenridge, Sway Road, Brockenhurst
1951	wHughes, T. C., M.A., F.S.A.	Oakrigg, Scotsforth, Lancaster
1951	Humble, Mrs. A.	Flat 5, 4 Manor Road
1952	Hunt, W. R., M.P.S., M.S.F.	100 Petersfield Road, Boscombe, E.
1930	Hurt, Miss C. E. C. J.	Flat 31, Ingleby, 6 Wimborne Road
1952	Imlach, C. M., M.A.	Crofton Redcotts, Wimborne, Dorset
1952	Imlach, Mrs. M. G., B.A.	,, ,,
1950	Ingleton, Mrs. E. E.	66 Seaward Avenue
1950	Isaacs, G. H., B.A.	Southmead, 4 Mountbatten Road
1950	Isaacs, Mrs. I. F.	,, ,,

1940	Jackson, Miss E. M., B.A.	Kilmory, York Road, Broadstone
1948	Jackson, J. O.	44 Herberton Road, W. Southbourne
1943	Jaggers, Mrs. E.	15 Elmsway, Southbourne
1933	James, Mrs. M. G.	70 St. Alban's Avenue
1947	Jaques, Miss M.	Croft Cottage, Forest Road
1945	Jenkins, Miss P.	Hinton St. Michael, Christchurch
1951	Jenkins, Miss S.	58 Wellington Road
1950	Jennings, R. J.	Latymer, 99 Seafield Road, Southbourne
1950	Jennings, Mrs. G. M.	,, ,,
1950	Jessop, Miss B. M.	27 Southwood Avenue, West Southbourne
1930	Jones, Miss A. Parnell	Yealand, King's Drive, Pagham, Bognor Regis, Sussex
1950	Jones, Miss M., B.SC.	Bournemouth School for Girls, Gervis Road
1930	Jubb, Miss O.	12 Oban Road

1950	Kaye, Brig. G. L.	Heathland, Flaghead Road, Canford Cliffs
1930	†*Keeble, Sir F. W., K.B.E., D.SC., F.R.S.	Address unknown
1928	Kendall, Miss G. J., A.R.C.M.	20 Serpentine Road, Poole
1942	Killick, Mrs. M.	31 Gorsehill Road, Poole
1936	King, Mrs. A.	37 Linwood Road
1946	King, Miss A.	46 Surrey Road
1944	Kirke, Miss M.	Flat 3, 34 Dean Park Road
1948	Knight, Miss A.	Apia, Fairview Road, Broadstone

1952	Lacey, Miss M. A.	North Brook, 10a Wimborne Road
1951	Lane, A. J.	Flat A, 41 Christchurch Road
1952	Lane, Mrs. L. F.	,, ,,
1952	aLane, Master P. L.	443 Christchurch Road
1942	Lanham, Miss O.	31 Gorsehill Road, Poole
1950	Lanning, J. P.	2 Gainslea Court, Derby Road
1950	Lanning, Mrs. C. M.	,, ,,
1951	Lavender, J. H.	1 Manor Road, Christchurch
1950	Lawton, W. M.	Cleeve Court, Knyveton Road
1951	aLawton, J. N.	,, ,,
1951	aLawton, W. N.	,, ,,
1942	Le Fèvre, Miss W.	791a Christchurch Road, Boscombe
1947	Legat, A. W., M.INST.C.E.	6 Thistlebarrow Road
1947	Legat, Mrs. E.	,, ,,
1947	Legat, Miss J. P.	,, ,,
1948	Leonard, H. W.	1 Neville Court, Derby Road
1948	Leonard, Mrs. N.	,, ,,
1950	Ley, Mrs. L.	23 William Road, Queen's Park
1949	Liddell, D.	22 Marlborough Road
1949	Liddell, Mrs. S.	,, ,,
1950	Lincolne, Miss H. M.	63 Watcombe Road, Southbourne
1951	Lloyd, G. B., B.A.	58, Glenferness Avenue
1950	Locke, S. L.	Northgate, Salisbury Road, Ringwood
1950	Locke, Mrs. J. B. E., B.A.	,, ,,
1947	Logan, Miss A.	Top Flat, 37 Branksome Wood Road
1952	Logie, Mrs. G.	179a Richmond Park Road
1947	Lovell, Miss D.	33 Commercial Road, Parkstone
1939	Lowde, Miss E., B.A.	Kilmory, York Road, Broadstone
1951	wLowe, Mrs. D. M.	43 Marryat Road, Wimbledon, London, S.W.19
1934	Lowther, Miss D. M., B.SC.	Lonsdale, Mayfield Avenue, Parkstone
1948	Lowther, Mrs. E. L., S.R.N.	Meyrick Lodge, Bodorgan Road
1952	Lyall, R. E., M.A.	151 Cranleigh Road
1951	wLyver, Mrs. D. J.	Grove Lodge, Burgess Hill, Sussex

1951	wMacmillan, W. F. F.	Botton Hall, Danby, Yorks.
1951	Magee, Mrs. M. L.	21 Carbery Avenue, Southbourne
1948	Markwick, Miss D.	67 Norton Road, Winton
1952	Marsh, K. J. J., L.R.I.B.A.	Little Place, Harbour Road, Southbourne
1951	Marsh, Mrs. V. M.	,, ,,
1946	Marshall, Miss D.	117 N. Selsden Road, Sanderstead, Surrey
1946	Masters, Mrs. S. M.	4 Gorsehill Road, Poole
1950	Mayo, H. C.	Green Lawn, 23 Crossway, Christchurch
1950	Mayo, Mrs. S. E.	,, ,,
1952	McDonald, Miss D.	Elstead Hotel, Knyveton Road
1952	McKee, Mrs.	21a Wayside Road
1950	Megget, E. E., V.D.	14 Southlea Avenue, Southbourne
1950	Megget, Mrs. K., M.B.E.	,, ,,
1950	Mersen, Miss A., B.SC.	Streate Place, St. Peter's Road
1929	Meyrick, Sir George, BART.	Hinton Admiral, Christchurch
1939	Middle, Miss A. M.	Tregenna, Castle Lane
1951	Millar, Mrs. S. A. T.	239 Sandbanks Road, Parkstone
1934	Mitchell, Miss E. A.	109 Edgehill Road
1950	Mitchell, W.	St. Margaret's, Valerie Road
1949	Moir, Mrs. F.	9 Crossway, Christchurch
1932	Mullins, Miss D. E. A.	Rosemaryne, 111 Edgehill Road
1952	Mullins, Mrs. S.	41 Grand Avenue, Southbourne
1951	wMundy, Miss M. E.	56 Lancaster Gate, London, W.2
1951	Munford, Rev. F. A., B.A.	64 Fernside Road, Poole
1936	Murdock, Miss J. C.	3 Rotherfield Road
1950	Murgatroyd, J. H., F.L.S., F.Z.S., F.R.E.S.	9 Warren Edge Road, Southbourne
1950	Murray, Mrs. M. L.	Redmore, Crescent Road, Branksome Park
1935	Muspratt, C. K., M.A., F.R.G.S.	25 East Avenue
1935	Muspratt, Mrs.	,,

1939	Newsome, S. H.	184 Belle Vue Road, Southbourne
1939	Newsome, Mrs.	,, ,,
1943	LNicholls, Miss G.	17 Waltham Road
1950	North, Miss S. F.	4 Hampton Court, Branksome Wood Road
1948	North-Row, St. J. K.	75 Lansdowne Road

1929	Ogden, Miss E.	Vailima, Fairview Road, Broadstone
1948	Ogden, F.	30 Grosvenor Court, Vale Road
1948	Ogden, Mrs. G.	,, ,,
1950	Ogle, Miss U.	Little Wyfold, Frankland Crescent, Parkstone
1948	Osborne, Mrs. C. H.	B6 San Remo Towers
1948	Osborne, G.	77 Hengistbry Road, W. Southbourne
1948	Osborne, Mrs. E.	,, ,,
1944	Owen, Mrs. E.	2 Rotherfield Road, Boscombe
1950	Owen, J. S.	,, ,,

1945	Paris, Lt.-Col. A., R.E. (ret'd.)	10 Carbery Avenue, Southbourne
1951	Parrock, Mrs. L.	Flat 3, 147 Holdenhurst Road
1950	Paterson, Miss M. W.	Queenswood School, Hatfield, Herts.
1945	Penny, Miss A.	Cottonwood, E. Cliff
1916	LPenrose, Miss F.	Little Picket, Hightown, Ringwood
1916	LPenrose, Miss M., B.SC.	,, ,,
1948	Perceval, Mrs. W.	7 Benellen Avenue
1950	+vPeters, Prof. Sir R. A., M.C., M.A., M.D., F.R.S.	14 Brookside, Headington, Oxford

1951	Pickard-Cambridge, W. A., M.A.	Brimlands, Broadstone
1951	Pickard-Cambridge, Mrs. H.W.	,,
1946	Pickering, Mrs. G.	23 Danesbury Avenue, Southbourne
1952	Pierce, E. V.	Little Bushey, 63 Leybourne Avenue
1952	Pierce, Mrs. E. L., M.B.E.	,, ,,
1952	Piggin, Mrs. K. I.	Holme Farm, Keyworth, Notts.
1948	Pooley, E. R.	Corrie Lodge, 50 Woodville Gardens, Ealing, W.5
1947	Pope, A. E.	33 Pine Crescent, Highcliffe, Hants.
1947	Pope, Mrs.	,, ,,
1951	Price, Miss E., S.R.N.	9 Windermere Road
1946	Prideaux, Mrs. A.	Upmoor, Ravine Road, Canford Cliffs
1946	Prideaux, Miss C.	,, ,,
1950	Pullman, Miss F. M.	Heather Lodge, 15 Burton Road

1924	Quick, Mrs.	Tregenna, Castle Lane
1951	wQuillet, L. A.	"Sevenoaks," Springfield, Chelmsford

1952	Ramble, Mrs. M.	100 Wolverton Road, Boscombe
1946	Rayner, Mrs.	16 Oban Road
1951	Rayson, Mrs. M. C. J.	83 Watcombe Road, Southbourne
1945	vRead, W. J., M.SC., F.R.I.C.	15 Carbery Avenue, Southbourne
1946	Read, Mrs., F.Z.S.	,, ,,
1950	Redfern, Rev. L., M.A., B.D.	46 St. Luke's Rod, Bournemouth
1950	Redfern, Mrs. E., M.A.	,, ,,
1950	Redrupp, Mrs. S. P. J.	21 R. L. Stevenson Avenue, Westbourne
1924	*Reid, Mrs. E. M., B.SC., F.L.S.	Pinewood, Milford-on-Sea
1946	Retzbach, Miss A. M.	Rothbury, West Cliff Gardens
1945	Richards, Miss E., B.SC.	8 Overcliff Mansions, Manor Road
1942	Richards, Miss M.	Stour Lodge, Julian's Road, Wimborne
1946	Richardson, J. G.	Abbotsdene, Seafield Road, Friars Cliff, Christchurch
1950	Richardson, W. S., M.D., F.R.C.S.	Rossmore, Boscombe Spa Road
1926	Rix, Miss M. E. de B.	Wayside, Stourcliffe Avenue
1949	Robertson, Mrs. M.	41 Christchurch Road
1949	Robertson, Mrs. W.	24 Poole Road
1939	Robins, E. A., F.R.P.S., F.L.S., F.R.M.S.	Fairway, Stanley Road, Waterford, Lymington
1929	Robinson, Miss M. H.	Byways, Chaddesley Glen, Canford Cliffs
1929	Robinson, Miss W. A.	,, ,,
1923	Roden, Miss E. M.	12 Walpole Road, Boscombe
1947	Rooke, Dr. K. B., M.B., B.CH., M.B.O.U.	Cranborne, Wimborne
1952	Rowell, Miss E. M.	Lyndon, 19 Compton Avenue, Parkstone, Dorset
1935	Rush, Miss C. J.	9 East Avenue
1943	Rushton, J.	112 Alumhurst Road
1951	Rushton, Mrs. E.	,, ,,

1943	Sadler, H. G.	Chester House, Boscombe Spa Road
1951	wSalisbury, Sir E., D.SC., F.R.S., F.L.S.	Royal Botanic Gardens, Kew, Surrey
1942	Sanford, E. G., A.M.I.MECH.E., A.M.I.E.E.	Welbeck, Danecourt Road, Parkstone
1941	Sanford, Mrs. M. A.	,, ,,
1950	Sawyer, Mrs. M.	37 Belvedere Road
1938	Seare, Mrs. H.	Almer, Blandford

1951	wSecretan, S. D.	Swaines, Rudgwick, Sussex
1950	Sedgewick, Mrs.	Pirbright, West Cliff Gardens
1950	Seth-Smith, D. N., B.A., M.B., B.CH.	7 Rothesay Road
1941	Sexton, Miss F.	60 Uplands Road
1951	Sewell, Miss I.	Flat 1, 445 Christchurch Road
1948	Shears, Miss E.	Manor House, Manor Road
1933	Sheffield, Miss I. E.	177 Richmond Park Road
1950	Shillidy, G. A. S., C.I.E.	35 Barton Court Road, New Milton, Hants.
1944	LShorthouse, B.	Brookside Cottage, Exeter Lane
1937	Simmons, Mrs. I. M.	Trigonia, Spur Hill Avenue, Parkstone
1920	Simpson, N. Douglas, M.A., F.L.S., F.R.M.S.	Maesbury, 3 Cavendish Road
1945	Smith, W. G.	22 Stanpit, Christchurch.
1951	Smooker, Miss G. M.	5 Meon Road
1951	Smooker, Miss L. G.	,,
1947	Smythe, V. du B., F.R.N.S.	Sherwood, Irving Road, W. Southbourne
1947	Smythe, Mrs. M.	,, ,,
1950	Sobbe, F. A.	Manica, Tower Road, Branksome Park
1947	Sobbe, Miss D.	,, ,,
1947	Sobbe, Miss V.	,, ,,
1940	Somerville, Mrs. S.	Rumah Kechil, Pinewood Road, Ferndown
1952	Spry, Miss A. G., L.L.A.	17 Ravenscourt Road
1949	Stanton, H. K.	1097 Christchurch Road
1951	Stevenson, F. W., M.R.I.	Talbot Ridge, Little Forest Road
1947	Stuart-Harris, Miss M., B.SC.	Windycroft, Worth Matravers
1946	Stuart-Harris, Miss W., B.SC.	,, ,,
1942	Styche, Mrs. E. L.	19 Heatherden Avenue, Parkstone
1950	Sworder, Miss R.	12 Grosvenor Court, Vale Road, Bournemouth

1952	Tanner, Miss F. R.	11 Springfield Crescent, Parkstone
1952	Taylor, Mrs. F. M.	20 Egerton Road, Queen's Park
1937	Terrell, G. H.	53 Wentworth Avenue, Boscombe
1946	Thane, Miss V., M.A.	23 Cecil Court, Charminster Road
1951	Thomas, Mrs. M.	113 Alumhurst Road
1952	Thomson, Mrs. R. Roberts	Keverstone Court, Manor Road
1950	Tibbitt, Miss M.	F.6 Pine Grange, Bath Road
1951	wTierney, Dr. C.	Netherton, Coulsdon, Surrey
1951	wTierney, Mrs.	,, ,,
1951	wTilling, W. G.	20 Streathbourne Road, Upper Tooting, London, S.W.17
1951	Tottenham, R. C.	The Elms, Wheeler's Lane, Knighton, Wimborne
1936	Trayfoot, Mrs. L. W.	25 Eaton Road, Branksome Park
1944	Turner, Miss E. C.	18 Cassel Avenue, Westbourne
1949	*Turner, G. A.	Winchester House, Fir Vale Road

1950	Venning, Brig. F. E. W., C.B., C.B.E., D.S.O., M.B.O.U.	Pinewood, Butts Ash, Hythe
1950	Venning, Mrs. E. L.	,, ,,
1950	Venning, Miss E. J. L.	,, ,,

1952	Waldy, Mrs. V. M. de G.	The Paddock, Dover Road, Branksome Park
1921	Wales, Miss N.	The Nook, 4 Ormonde Road
1945	Walker, F.	57 Richmond Park Avenue
1945	Waller, Miss C.	76 Ensbury Park Road
1952	Wallis, Major P.	121 Queen's Park Avenue
1952	Wallis, Mrs.	,, ,,

1952	Walls, R. R., M.A., B.SC., F.G.S.E.	Strathyre, 42 Manor Avenue, Parkstone, Dorset
1951	wWard, W. S.	44 Lesser Avenue, Clapham Common, London, S.W.4
1952	Warden, Miss F., M.C.S.P.	Flat 3, 69 Seamoor Road, Westbourne
1950	Warren, Miss A. E.	1 Gordon Road, Boscombe
1941	Watson, Miss G. V.	Manor Lodge, 20 Manor Road
1941	†LWVWatt, Mrs. W. Boyd, F.Z.S., M.B.O.U.	52 Wimborne Road
1946	Watts, Miss N. E.	3 Dunbar Road
1952	Way, Mrs.	60 Brackendale Road
1936	Weekes, Mrs. M.	3 Rotherfield Road, Boscombe
1951	Wells, G.	26 Dingle Road, Boscombe
1947	West, Miss G. M.	1 Lucerne Avenue, Southbourne
1951	aWest, I. M.	44 Gerald Road
1918	*Whitaker, S.	22 Somerset Road, Boscombe
1924	Whitaker, Miss E. M.	,, ,,
1924	Whitaker, S. E., P.A.S.I.	22 Selwood Road, Addiscombe, Croydon
1951	wWhite, Miss C.	33 Manor Road, Bexhill-on-Sea
1951	White, Miss H. A.	Little Place, Harbour Road, Southbourne
1931	aWhite, S. J.	7 Gilbert Road
1950	aWhitelaw, P.	18 Beechwood Avenue, Boscombe
1952	Williams, P.	Woodend Forest Corner, Ringwood
1952	Williams, Mrs. W. M.	,, ,,
1942	Williamson, F., F.R.HIST.S.	24a Rushton Crescent
1947	Wilson, Miss G.	9 Glenmoor Road, Winton
1950	Wilson, G. E.	10 Westdown Road, Kinson
1950	Winter, W. P., B.SC.	Latimer House, 27 Horsa Road
1951	Winter, Mrs. W. P.	,, ,,
1950	Wiseman, Capt. L. G., O.B.E.	Avon Private Hotel, 4 Chine Crescent Road
1948	aWood, Miss B., B.SC.	4 New Park Road, W. Southbourne
1951	wWood, Mrs. L.	The Oaks, Sawbridgeworth, Herts.
1950	Wood, Miss L.	54 Ophir Road
1903	†OVWoodhouse, W. J., A.C.P., M.I.H.	29 Twynham Road, Southbourne
1949	Wray, D. A., M.SC., PH.D., F.G.S.	42 Canford Cliffs Road
1949	Wray, Mrs. A.	,, ,,
1932	*Wren, G. G.	420 Charminster Road
1946	Wycherley, Mrs. L.	40 Littledown Avenue, Queen's Park

Summary of the Accounts for the Year ending 30th September, 1952

Receipts.

	£	s.	d.	£	s.	d.
1st October, 1951.						
Subscriptions to 30th Sept., 1952	524	0	0			
,, Year 1952-53	28	15	0			
				552	15	0
Rents.						
Royal Empire Society	100	0	0			
Camera Club	54	0	0			
Hire of Hall	4	19	0			
				158	19	0
Garden Party	34	19	11			
New Year Party	19	7	6			
Lecture, Lord Alanbrook's	15	0	3			
				69	7	8
Teas				12	19	4
Field Meetings				4	1	0
Gilbert White Fellowship	10	0	0			
* Do. Refund of Loan	70	0	0			
				80	0	0
Donations				59	4	0
Income Tax Refunded				93	3	3
Gas: Royal Empire Society				4	16	2
Telephone				1	9	7

Payments.

	£	s.	d.	£	s.	d.
Rates				138	7	6
Repairs and Maintenance				94	11	11
Insurance				20	5	3
Wages of Caretaker				80	10	8
Library				14	4	10
Garden Maintenance				47	2	8
Garden Seats				34	1	6
Coal	8	17	10			
Electricity	33	0	0			
Gas	102	19	8			
				144	17	6
Water				4	6	0
Printing and Stationery	85	6	8			
Proceedings	75	5	6			
Postage	31	10	11			
Telephone	11	4	1			
Bank Charges	13	10	6			
				216	17	8
Subscriptions to other Societies				6	6	0
Total of Ordinary Payments				801	11	6

Interest on Investments		21 0 0
Sundry Sales		1 16 6
Total of Ordinary Receipts ...		1059 11 6
Transfer from Twemlow Bequest Fund	543 14 6	
do. do. do.	564 1 6	
do. do. do.	7 17 6	
		1115 13 6
		£2175 5 0

Roof and Ceiling Repairs		584 15 9
Overdraft at Bank on 1st Oct., 1951	449 13 8	
Add Cheques not presented ...	11 7 0	
Due to Treasurer on 1st Oct., 1951	1 14 1	
		462 14 9
30th Sept., 1952.		
Balance at Bank	335 16 4	
Less Cheque not presented	1 10 0	
	334 6 4	
Less due to Treasurer	8 3 4	
		326 3 0
		£2175 5 0

We have examined the above accounts with the Books of the Society and the Vouchers for payment and certify the same to be correct.

Bournemouth, 20th October, 1952.

A. A. FOYLE
F. WILLIAMSON } Auditors.

WILLIAM J. WOODHOUSE,
Hon. Treasurer.

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* A loss was incurred in respect of the Gilbert White Exhibition held in September 1951 which was generously met by a member.

ARCHAEOLOGICAL RESEARCH FUND (DEPOSIT ACCOUNT).

	£	s.	d.		£	s.	d.
1st Oct., 1951.				30th Sept., 1952.			
Balance	10	14	5	Balance	10	17	5
Interest		3	0				
	£10	17	5		£10	17	5

MACDOUGAL BEQUEST INVESTMENT ACCOUNT.

	£	s.	d.		£	s.	d.
1st Oct., 1951.				30th Sept., 1952.			
2½% Treasury Stock	1000	0	0	Balance	1000	0	0
	£1000	0	0		£1000	0	0

TWEMLOW BEQUEST FUND (DEPOSIT ACCOUNT).

	£	s.	d.		£	s.	d.
1st Oct., 1951.				Transfer to Current Account	1115	13	6
Cash received from Executors	5043	14	6	Investments Purchased	2761	4	6
				30th Sept., 1952. Balance	1166	16	6
	£5043	14	6		£5043	14	6

TWEMLOW BEQUEST FUND (INVESTMENT ACCOUNT).

	£	s.	d.		£	s.	d.
1st Oct., 1951.				30th Sept., 1952.			
£1000 3% Defence Bonds	993	19	0	Balance	2761	4	6
£1000 3½% British Transport Stock	775	4	0				
£1000 British Electricity Stock 4¼% ...	992	1	6				
	£2761	4	6		£2761	4	6

Council's Report for the Year ending September 30th, 1952

The membership of the Society has increased from 445 on September 30th 1951 to 494 on September 30th 1952. The number of new members was 116, including the 28 remaining members of the Gilbert White Fellowship who were added when that society was dissolved, while 67 names were removed from the list through death, resignation or other causes.

The Council has to report with regret the death of the following members :—Surgeon Commander W. N. Blatchford, R.N., Mr. A. W. Fithian, Rev. W. E. Lowther, Miss S. McBean, Miss Ousby-Trew, Miss G. D. Pankhurst, Mr. R. D. Pontifex and Mr. W. G. Wallace.

The thanks of the Society are due to the Chairmen of Sections for the preparation of the bi-monthly programmes, a task which is certainly the keystone of the Society's activities. The work of Mr. Leonard as secretary to that committee, and of the ladies responsible for posting the programmes to members, have been invaluable. The assistance of the Lanternists, which contributes so much to the success of lectures, and the work of the Ladies' Committee in providing tea, are also acknowledged with sincere thanks.

Mr. V. du Bédat Smythe kindly consented to become Chairman of the Zoology section on the resignation of Mrs. Boyd Watt, who had filled this office with distinction for 10 years.

The duties of Editor, which were carried on by the Editorial Committee on the death of the Rev. W. E. Lowther, have now been undertaken by Mr. F. Coleman, who is seeing this number of the Proceedings through the press.

The President, Mr. Ernest Chambers, delivered his Presidential address on "Plant Ecology" on October 27th, 1951. This was published in the last number of the Proceedings. Mr. Chambers has served the Society with unflagging zeal throughout the past year, and the Council wishes to express its gratitude for the way in which he has upheld the dignity and prestige of the Society.

Indoor meetings during the year numbered 70, and Field Meetings 63. The usual public lectures were given monthly, in the evenings, from October to March.

For the second year the Society supplied members to give talks on the Natural History and Topography of the district to the scholars attending the Wick Ferry School Journey Camp, and to act as guides on some of their outings. Mr. Chambers organised the series, and was assisted by Messrs. Brown, Legat, Read, Smith, Smythe, Williamson and Woodhouse. Professor

Cameron also gave a mid-week lecture. Mr. Woodhouse again lent the lantern and in most cases was also the operator. The talks and the conducted outings were greatly appreciated by all the staff and scholars.

During the first week in September 1952, the Society took part in the "Leisure and Pleasure" exhibition at the Town Hall, organised by the Bournemouth Rotary Club. This was a considerable undertaking which would have been impossible without the co-operation of a large number of members, who assisted in the erection and arrangement of the Society's exhibit, delivered lectures illustrated by lantern slides and supervised the sections over the whole week. The proceeds were devoted to the "Rotary Holiday Camp for Boys," at Swanage.

The Entertainment Committee arranged the New Year Party on January 5th and a Garden Party on July 19th, both of which were well attended and successfully carried through. Those of us who merely enjoyed these occasions also realise the hard work which they entailed.

During the year the Society received a legacy of £5,000 under the will of a late member, Miss E. E. Twemlow, whose death was reported in the last number of the Proceedings. This generous gift has enabled the Society to carry out long-needed repairs to the roof of the premises at 39, Christchurch Road, and to increase its assured income by investment. It has also made possible the provision of modern projection apparatus which will add considerably to lecture facilities. The Society owes much to Mr. A. W. Legat and Mr. W. J. Read for the services they have rendered in this connection.

Special mention should be made of the lecture at the Winter Gardens arranged by Mrs. Boyd Watt on December 8th 1951, at which Field-Marshal the Right Hon. Viscount Alanbrooke showed his own colour films of the Golden Eagle, the Hobby and the Avocet. These were followed by colour films made on the Bird Reserves maintained by the Royal Society for the Protection of Birds. There was a large and appreciative audience.

In the Museum, the Curator, Mr. F. Williamson, with the assistance of Miss Child and Miss Geer, and with the co-operation of the Chairmen of Sections, has effected a marked improvement in the display and arrangement of the specimens. The Society is much indebted to these members for the steady, unobtrusive work they have done and which they continue to do.

The Council desires, on behalf of the Society, to thank the Library Committee, especially the Librarian and his Assistant, for the efficient conduct of the Library. It also wishes to express appreciation of the very good work done by the Garden Committee and helpers this year, under very difficult conditions.

A most pleasing and informal event took place on August 31st 1952, when the Council entertained Mr. Henry Bury to tea on the occasion of his 90th birthday. It was a privilege to offer him the congratulations and good wishes of the Society.

The Council has to acknowledge receipt of many valuable gifts from members and others, for use in its various activities : the amenities of the Society and its value to members are being continually increased by such acts of generosity. The Council would assure the donors that their gifts are received with the warmest appreciation.

Given the continued support of the members, which has been so conspicuous a feature of the past year, the Council feels that the Society can look forward with confidence to the year 1952-53.

Seven Year Covenant Scheme

The Council would like to see more members undertaking the seven year covenant for subscriptions. If the member is paying income tax at the higher rate, (9/6 in the £) the Society can recover so much of the tax as almost to double the value of the subscription. All the member does is to pay the ordinary subscription and sign a certificate once a year. This is how the scheme works out :—

The tax on £2 17s. 2d. at 9/6 in the £ is £1 7s. 2d., leaving a balance of 30/-. If this is paid in subscription, the Society can reclaim the £1 7s. 2d. paid in income tax. Thus—A subscription of :

30/- under covenant provides £2 17s. 2d. to the Society.
50/- ,, ,, ,, £4 15s. 4d. ,, ,,
15/- ,, ,, ,, £1 8s. 7d. ,, ,,

and so on, pro rata.

It is felt that, among our large membership, there are probably many others who would assist in this way, if they understood the procedure and the need.

We would emphasise that the covenants are terminated by death, that the whole business of recovering the tax is done by the Society, and that the member, if liable to taxation at the maximum rate on part of his income, undertakes no other liability than the ordinary subscription.

The Secretary will be pleased to provide forms and any further information.

Programme of the Society's Activities, 1951-1952

GENERAL AND NON-SECTIONAL.

1951

Oct. 27th. Presidential Address: "Plant Ecology," by Ernest Chambers, F.L.S.

Nov. 24th. Annual General Meeting.

EXHIBITIONS and ENTERTAINMENTS.

1952

Jan. 5th. New Year Party.

July 19th. Garden Party.

Sept. 1st to 6th. Rotary Club Exhibition at Town Hall, Bournemouth, "Leisure and Pleasure".

OPEN PUBLIC MEETINGS.

1951

Sept. 19th-22nd. Gilbert White Exhibition (Lectures at 3 and 7.30 p.m.).

Oct. 31st. "Life in a Mediæval Monastery," by F. W. Robins, F.S.A., F.R.G.S.

Nov. 14th. "Cloud and Weather", by H. E. Clarke, M.A., B.Sc., F.R.I.C.

Dec. 8th. "Golden Eagle, Hobby and Avocet," by Viscount Alanbrooke, K.G., G.C.B., O.M., D.S.O.

Dec. 12th. "Madeira with a Colour Camera," by A. W. Legat, M.I.C.E.

1952

Jan. 9th. "Poisonous Plants," by Ernest Chambers, F.L.S.

Feb. 13th. "Origin, Growth and Decay of Mountains," by D. A. Wray, M.Sc., Ph.D., F.G.S.

Mar. 12th. "The Microscope for Leisure and Pleasure," by J. H. Murgatroyd, F.L.S., F.Z.S., F.R.E.S.

SECTIONAL.

NOTE.—Field Meetings by Coach are marked (C).
Field Meetings by Train are marked (T).
Field Meetings by Water are marked (W).
Names of Leaders are shown in brackets.

Archaeology and History.

1951

Sept. 13th. "Saxon Churches of Hampshire," by F. Williamson.

Sept. 19th. Gilbert White Exhibition.

Oct. 31st. "Life in a Mediæval Monastery," by F. W. Robins.

Nov. 17th. "Ancient Egypt and its Story," by J. Cameron.

Dec. 15th. "Our Furniture: Its Links with History and Custom" (1), by T. H. Bickel.

1952	
Jan. 22nd.	"Isle of Purbeck during the Roman Occupation," by J. B. Calkin, M.A., F.S.A.
Feb. 23rd.	"The Place Names of Hampshire," by F. Williamson.
Mar. 27th.	"The Ancient Crosses of Cornwall," by W. S. Brown.
Mar. 27th.	"Our Furniture: Its Links with History and Custom" (2), by T. H. Bickel.
June 13th.	(C). More Saxon Churches of Hampshire (F. Williamson).
July 9th.	Hurn Court (Miss K. M. Chilver).
Aug. 15th.	(C). Portchester Castle and Southsea (F. Williamson).

Astronomy.

1951	
Dec. 1st.	"A Century of Star Study," by W. P. Winter, B.Sc. (1). Distances, Sizes and Masses of the Stars.
Dec. 29th.	(2). Use of the Spectroscope and its Teachings.
1952	
Jan. 30th.	(3). Interiors of the Stars and Sources of their Energy.
Feb. 27th.	(4). New Stars and Galaxies.
Mar. 29th.	"Celestial Photography," by Prof. F. O'B. Ellison, M.D., F.R.A.S.

Botany.

1951	
Sept. 4th.	(T). Corfe (Scotland Farm) (W. S. Brown).
Sept. 11th.	Hengistbury Head (Miss Gorringe).
Sept. 29th.	(T). Beaulieu Road Station (W. S. Brown).
Oct. 3rd.	Lychett Heath (Miss Banham).
Oct. 11th.	Stoney Down and Corfe Mullen (Miss Lanham).
Oct. 17th.	Fungus Foray at Morden Park (Mr. and Mrs. Belcher).
Oct. 23rd.	Fungus Foray at Brockenhurst (Miss Sheffield and Miss Banham).
Nov. 8th.	(C). New Forest for Autumn Tints and Fungi (The Misses Penrose).
Nov. 27th.	"Some Conifers," by Brig. Venning, C.B., C.B.E., D.S.O., M.B.O.U.
1952	
Jan. 10th.	"Introduction to Mosses and Liverworts of Bournemouth," by E. C. Green, B.A., F.L.S.
Feb. 14th.	"Floral Survey: with reference to Poets," by Miss Ursula Ogle.
Mar. 4th.	Lilliput and Evening Hill (Miss Banham).
Mar. 13th.	"Mosses with Microscope," by Miss L. M. Child.

Apr. 1st.	(Jointly with Zoology). Near Studland Heath (Miss Banham).
Apr. 16th.	(Jointly with Zoology). Lytchett Matravers to Beacon Hill (Miss Banham and V. du Bédat Smythe).
Apr. 25th.	(T). Colewood, Wool (W. S. Brown).
Apr. 30th.	Bloxworth to Bere Regis (Miss Banham).
May 3rd.	Hinton Admiral (Miss Banham and W. S. Brown).
May 8th.	Spettisbury (Miss M. James and H. C. Mayo).
May 12th.	Pamphill and Cowgrove (Miss Gorringe).
May 15th.	Ironswell Pond and Sloden Wood (Miss Banham and E. Chambers).
May 20th.	Winkton (W. G. Smith).
May 24th.	Studland Heath and Littlesea (Miss Graham and Miss Jones).
May 28th.	Morden Park (Mr. and Mrs. Belcher).
June 4th.	St. Catherine's Hill (W. G. Smith).
June 7th.	(T). Beaulieu Road and Denny Bog (Mrs. and Miss Haines).
June 10th.	Cuss from Hinton Admiral (W. G. Smith).
June 17th.	(T). Corfe, East Hill (Miss Ogden).
June 19th.	(Jointly with Entomology). Fontmell Magna (W. S. I. Cox).
June 28th.	(T). Holmsley (Miss Jenkins).
July 2nd.	(T). (Jointly with Zoology). Durlston Head and Downs (Miss Gorringe).
July 4th.	Canford Magna and Dudsbury (W. S. Brown).
July 11th.	(C-W). Keyhaven and Hurst Castle (Brig. Venning).
July 14th.	(C). (Jointly with Zoology). Ballard Down (Miss Banham and Miss Ogle).
July 28th.	Lytchett Matravers to Beacon Hill Corner (Miss Banham and H. C. Mayo).
Aug. 7th.	(T). (Jointly with Zoology). Queen's Bower, Brockenhurst (V. du B. Smythe).
Aug. 9th.	(Jointly with Zoology). Christchurch Meadows (Mrs. Boyd Watt).
Aug. 12th.	Sopley (J. H. Lavender).
Aug. 18th.	(Jointly with Zoology). Brands Bay, Studland Heath (Miss Banham).
Aug. 30th.	Wootton Bridge (Miss Jenkins).

Entomology.

1951	
Nov. 20th.	"Indian Butterflies," by Miss K. M. Chilver.
1952	
Feb. 9th.	"Dragonflies," by Miss C. E. Longfield, F.R.G.S., F.R.E.S., F.Z.S., M.B.O.U.
Apr. 17th.	"Further Talk on Indian Butterflies," by Miss K. M. Chilver.

Geography.

1951	
Sept. 26th.	(C). Broad Chalke Valley (H. de Castro).
Oct. 4th.	(Jointly with Photography). "To Teneriffe with a Colour Camera," by A. W. Legat.
Nov. 1st.	(Jointly with Photography). "Madeira with a Colour Camera," Part 1, by A. W. Legat.
Nov. 29th.	(Jointly with Photography). "Old Bournemouth," by W. J. Woodhouse.
Dec. 6th.	(Jointly with Photography). "Fox Talbot Annivsary," by A. W. Legat.
1952.	
Jan. 3rd.	(Jointly with Photography). "Teneriffe with a Colour Camera," by A. W. Legat.
Jan. 26th.	"Some New Journeys in Dorset" by H. de Castro.
Mar. 6th.	(Jointly with Photography). "Madeira with a Colour Camera," Part 2, by A. W. Legat.
Apr. 3rd.	(Jointly with Photography). "Baghdad to the Caspian with a Camera," by Col. W. J. P. Rodd, D.S.O.
Apr. 23rd.	(C). Wilton House (H. de Castro).
May 21st.	(C). Blackmore Vale and Mintern (H. de Castro).
June 23rd.	(C). Blenheim Palace, Witney and Burford (H. de Castro).
July 25th.	(C). A Day in Bath, (H. de Castro).
Aug. 27th.	(C). Sidmouth, Ottery St. Mary and Honiton (H. de Castro and J. H. Bailey).

Geology.

1951	
Oct. 20th.	"Fossils and Evolution," by H. Bury.
1952.	
Jan. 12th.	"Geology of the Hampshire Basin," by F. C. Stinton.
Feb. 13th.	"Origin, Growth and Decay of Mountains," by D. A. Wray.
Feb. 16th.	"Geology and Evolutionary Theory," by H. Bury.
Apr. 19th.	"The Varied Pattern of British Landscape," by D. A. Wray.
July 16th.	(Jointly with Geography). Beaminster, Pilsdon Pen, Loders Hill and Poxwell (D. A. Wray and H. de Castro).

Microscopy.

1951	
Oct. 18th.	"Determination of Zoological Material," by J. H. Murgatroyd.
Nov. 15th.	(Jointly with Geology). "The Microscope in the Study of Rocks," by D. A. Wray.
Dec. 20th.	"Natural History Objects for the Microscope," by J. H. Murgatroyd.

1952	
Jan. 17th.	"Some Fresh Water Crustacea and Insecta," by J. H. Murgatroyd.
Feb. 21st.	"Worms, especially Earthworms," by J. H. Murgatroyd.
Mar. 12th.	"The Microscope for Leisure and Pleasure," by J. H. Murgatroyd. (See also Open Lecture).

Photography.

1951	
Oct. 9th.	(Jointly with Geography). "Letter from Goathorn," by A. W. Legat.
Dec. 10th.	(Jointly with Geography). "In Search of Beauty," cine film made by Major C. L. Cooper-Hunt, shown by A. W. Legat.
Dec. 12th.	"Madeira with a Colour Camera, Part 1," by A. W. Legat. (See also Open Lecture).
1952	
Jan. 8th.	(Jointly with Geography). "Karen Adventure," by P. Almack.
Feb. 7th.	"Snapshot Album," contributed by members.
Feb. 12th.	"Gilbert White and Selborne," by A. W. Legat.
Mar. 11th.	(Jointly with Geography). "Madeira with a Colour Camera, Part 2," by A. W. Legat.
Mar. 20th.	"Scenes in France and Germany," by H. Bury.
Mar. 24th.	(Jointly with Zoology). "Wild Life Photography," by V. du Bédat Smythe).
Apr. 8th.	"Landscapes and Flowers in Colour Photography," by Major C. L. Cooper-Hunt.

Physics and Chemistry.

1951	
Oct. 6th.	Visit to Bournemouth Fire Brigade (H. E. Clarke).
Oct. 25th.	Visit to new Electric Power Station, Poole (H. E. Clarke).
Nov. 3rd.	"Blood Groups and the Rhesus Factor," by Miss D. M. Lowther.
Nov. 14th.	"Cloud and Weather," by H. E. Clarke (see also Open Lectures).
Dec. 22nd.	"Railway Engines," by B. Gorton.
1952	
Jan. 15th.	"Chemistry for Non-Chemists" (2), by H. E. Clarke.
Feb. 2nd.	"Radium and the Curies," by Miss E. B. Wood, B.Sc.
Mar. 1st.	"Hormones : Chemical Messengers," by H. E. Clarke.
Apr. 5th.	"Chemistry for Non-Chemists" (3), by H. E. Clarke.
May 27th.	Visit to Cosmetics Factory of Max Factor & Co. (H. E. Clarke).

Zoology.

1951	
Sept. 6th.	(W). (Jointly with Botany). Poole Harbour and Wareham (Mrs. Boyd Watt).
Sept. 14th.	Bere Regis area (V. du B. Smythe).
Oct. 13th.	"Some Birds of the Littlesea Area," by J. C. Follett.
Nov. 10th.	"A Few more Animals," by B. Gorton.
1952	
Jan. 19th.	"The Causes of Metamorphosis," by H. Bury.
Mar. 8th.	"British Reptiles and Amphibians," by Major Maxwell Knight, O.B.E., M.R.I., F.R.M.S., F.Z.S.
Mar. 22nd.	"The Waders of Poole Harbour," by A. W. Bull, M.A.
May 6th.	(Jointly with Botany). Dancing Ledge (Miss Banham and V. du B. Smythe).
May 10th.	Stanpit Marshes for Bird Study (Miss Popham).
June 14th.	(Jointly with Botany). Lytchett Matravers (V. du B. Smythe).
June 24th.	(Jointly with Botany). Gore Heath and Sandford (V. du B. Smythe).
July 8th.	Across the Heath to Corfe (V. du B. Smythe and Miss Ogle).
July 23rd.	(C). (Jointly with Botany). Dancing Ledge (V. du B. Smythe).
Aug. 22nd.	(W). Cruise in Poole Harbour (V. du B. Smythe).
Aug. 28th.	Studland (V. du B. Smythe).

Report of Sections for the year ending September 30th, 1952

Library

The policy of purchasing recent books, dealing with the subjects covered by the various Sections of the Society, has been continued throughout the year. A further 17 books have been purchased and also one archaeological map of Ancient Britain.

This expenditure has been financed by the proceeds of the sale of old Journals of various Societies, which the Library Committee considered could be dispensed with. A total sum of £53 has been obtained thereby in the year.

The thanks of the Society are due to the following members for gifts of books and periodicals, viz. :—Mr. W. S. Brown, Mr. Burge, Mr. Bury, Mr. Chambers, Major Cooper-Hunt, Mr. Dacombe, Mr. Fountain, Mr. Legat, Mr. Marsh, Mr. Murgatroyd, Miss Penrose, Mr. Price, Mr. Rankin, Mr. and Mrs. Read, Miss Rothwell, Mrs. Watkin, and the Reading Circle for British Birds.

These represent a total addition by gift during 1951-52 of 36 books.

Mr. Coleman has helped considerably in the Library and Mrs. Perceval, Assistant Librarian, has done, among other duties, useful work in writing a complete set of new labels for the shelves.

All the books in the Library were removed on 17th September 1952 to Allen's Depository, to remain there while the roof was being reconstructed. It has been decided to alter the present arrangement and the books, on their return from storage, will be placed on the shelves in the order of the Sections concerned. This should facilitate obtaining any required volume.

The number of books and periodicals borrowed during the year was 403. This is an increase over that for 1950-51, viz., 330, which is largely due to the popularity of the new books purchased.

Members are reminded that two books may be borrowed at one time for a period of one month and that the Reference Library, which contains a large number of important books, may be used for reading purposes.

The following books have been purchased :—

The Sea around us. Rachel L. Carson.
History of Poole, Vol. 2. H. B. Smith.
The New Forest. H.M. Stationery Office.
Drawings of British Plants, Part 5. S. Ross-Craig.
Text Book of Entomology. A. D. Imms.
The Greenshank. D. N. Thompson.
Nature Parade. F. W. Lane.
Flora of the British Isles. Clapham Tutin and Wurburg.
British Mammals. L. H. Matthews.

Animal Life of the British Isles. E. Step.
Freshwater Life of the British Isles. J. Clegg.
Downs and Dunes—Their Plant Life. Sir Edward Salisbury.
List of Subject Headings for Small Libraries. M. E. Sears.
The Heritage of Early Britain. Eight Authors.
Coin Collecting. J. G. Milne and others.
Hormones—Their Properties and Uses. Dale, Emmens and others.
Popular Handbook of British Birds. P. A. D. Hollom.

A. A. FOYLE.

Museum

Several interesting gifts have been received during the year, notably a good collection of herbarium specimens from the late Mrs. Rothwell, who had been a member from 1916 until her death. Lt.-Col. F. C. Fraser has presented a small collection of foreign dragonflies, and a collection of 91 specimens to illustrate the families of Neuroptera. These the donor mounted in drawers from the Museum's cabinets. Mr. Bédat Smythe presented an egg of the flightless New Zealand bird, the *Apteryx* or Kiwi, whose eggs are very rare.

The work of re-arranging and cleaning the museum collections and cases has steadily progressed. The most noticeable change is the alteration of the large show-case which stood in the middle of the museum floor, dividing it into two and placing the two halves of the show-case along the north wall, making a total run of nineteen feet. This alteration has met with general approval, and the Hon. Curator is indebted to Mr. Butterworth for the help he gave in this awkward task.

The large collection of British birds' eggs and skins has been completely overhauled by Miss Child, and housed in cabinets Nos. 67 and 68, which have been brought into the Museum from the small bird store on the second floor. The specimens are arranged and numbered according to the Handbook, and the drawers are numbered to correspond. Members wishing to examine or refer to specimens are advised to use the systematic list at the end of Vol. V. of the Handbook.

More accommodation has been provided for the fossil collections, and a start has been made in re-arranging them. It is hoped to get assistance in re-labelling the specimens.

An interesting loan of 40 specimens to illustrate the history of the lamp has been received from Mr. F. W. Robins, F.S.A., which may be retained until the space is required for other exhibits.

The thanks of the Society are due to Miss Child, Miss Geer and Mr. Butterworth for their valued assistance, and to several Chairmen of Sections who have worked in their own departments.

F. WILLIAMSON.

Garden

Gifts of plants have been gratefully received from Mrs. Clarke, Mrs. Cox, Mrs. Cresswell, Mrs. Moir, Miss Sheffield and Messrs. W.S. Brown, H. A. Cooper, H. C. Mayo and W. J. Read.

A garden roller has been kindly presented by Mr. E. Chambers and a watering can by Mrs. Lanning.

The prolonged drought this summer has adversely affected the lawn, but its effect will probably not be permanent, and the flowering period of many annuals and perennials has likewise suffered. Mr. and Mrs. Leonard have, notwithstanding, succeeded in maintaining that gay appearance of their flower bed to which we have had pleasure in drawing attention in past reports.

The so-called Parrot's Bill or Glory Pea (*Clianthus puniceus*) growing against the Lecture Hall wall has been noticeable this summer by reason of its many bunches of scarlet claws.

The Brewer's Weeping Spruce (*Picea Breweriana*) with its graceful, pendulous branches, occupying a position opposite the front door, becomes yearly more attractive.

H. G. SADLER.

Archaeology and History

Two field meetings by coach were held, these were well attended and proved instructive.

On June 13th, five Saxon churches of Hampshire were visited, bringing the number now seen to eleven. On this occasion, a start was made at Breamore on the west borders of the shire, where the church is the most complete example of Saxon work in the county. From here a big sweep eastward took us to Little Somborne, Headbourne Worthy, Tichborne and Hinton Ampner. There are a few more churches with Saxon features on the eastern borders of the county, but none with features different from those already seen.

On August 15th, a visit was paid to Portchester Castle where the Roman "Fort of the Saxon Shore" was inspected, and the Norman castle and church within the fort were examined in detail.

The afternoon was spent at Portsmouth and Southsea, where some members inspected "The Victory", others the Cathedral and the seaside attractions of Southsea.

During May and the first half of June 1952, excavations were carried on at Hod Hill under the auspices of the British Museum, and some of our members visited the site while work was in progress. Professor Ian Richmond, of Durham University, one of our leading authorities on Roman Britain, had general supervision over the work, and Mr. J. W. Brailsford, F.S.A., of the British Museum was responsible from day to day. The principal objective this year was the plotting of the praetorium and the interior of the Roman fort. A clearing of refuse yielded a coin of Claudius, which confirmed the dating already suggested for the fort, which appears to have been occupied for a period of some thirty years only, during the second half of the 1st century A.D. Two bronze fibulae (one of the typical Hod Hill type), and other bronze and iron objects were exposed, also fragments of Roman and Belgic pottery, pieces of burnt daub, and large quantities of oyster shells, so often found on Roman sites. Work is expected to be resumed in 1953, making the third season of the present excavations.

The following notes on recent archaeological finds have been contributed by one of our members, Mr. J. B. Calkin, M.A., F.S.A.

A first century native Belgic jar was found near Beaulieu Avenue, Christchurch, when a drain was being laid in the spring of 1952. The jar has a vertical neck, outbent rim and two countersunk handles.

In May, a Bournemouth schoolboy picked up part of a bronze armlet on the north shore at Hengistbury, it is doubtless of Romano-British date, and was originally inlaid with enamel.

An Iron Age storage pit of the 5th or 4th century B.C. has recently been exposed in a quarry at Worth Matravers, Dorset, and the remains of carbonised wheat were found at the bottom. Among the rubbish which had been used to fill the pit in ancient times were numerous sheep bones, charcoal, a potsherd of Iron Age pottery and a bronze razor. The existence of an ancient farmstead in the locality was revealed a few years ago by the discovery of a saddle-quern and several storage jars.

The various recent finds described above may be seen in the Red House Museum, Christhurch, where the archaeological collections have recently been enriched by two important bequests : (1) Neolithic and Early Bronze Age relics from the Holdenhurst Long Barrow; (2) Late Bronze Age urns from the Latch Farm urnfield.

F. WILLIAMSON.

Astronomy

The past session has seen a revival of interest in this section. Four lectures were delivered by the Chairman on "A Century of Star Study," being a review of stellar research since Sir David Gill laid the foundations of the survey of the Universe by his determination of the parallax of Centauri and concluding with the work done at Mt. Wilson and Palomar on the recession of the spiral nebulae. Separate lectures were given on Astronomical Spectroscopy, on the Internal Constitution of the Stars and the nuclear sources of their energy.

In April the Society had the great pleasure of an address by Professor Ellison on Astronomical Photography, profusely illustrated by very fine slides, and we are greatly indebted to Dr. Ellison who has spent many years in this most fruitful work.

We may note in passing that the Section has had "une bonne presse."

W. P. WINTER.

Botany

Fine weather in 1952 favoured good musters at Field Meetings which included several new "botanizing" routes. Also, by generous permission, members were able to study interesting trees at Heron Court, Canford School and Deans Court, Wimborne and also uncommon cultivated and indigenous plants at Hinton Admiral, Woodtown, Studland Rectory and Burley Rock Gardens. Many opportunities were taken for study of Plant Ecology. New ground for the Fungus Foray at Morden Park was noteworthy for quantities of *Amanita muscaria* and *Boletus edulis* of abnormal size.

Brig. Venning records *Sparganium angustifolium* Michx in disused gravel pits—now ponds—near Hatchet Pond. Long-beaked fruits confirm the species. He also reports new localities for *Ludwigia palustris* at E. Boldre and Norley Copse discovered by Mr. Paul Bowman. As the species is known at Sowley Pond, this may be a case of the dispersal of the seeds, up the Crockford stream and a tributary, by the feet of birds; though the original growth may have been at E. Boldre and the seeds carried by water. Brig. Venning further mentions that *Ludwigia palustris* now appears in many aquaria and is cultivated on a large scale just outside London for sale to aquarists so that this rare wild flower may soon be widely dispersed. He is certain, however, that it is not a recent arrival at E. Boldre as the pond is full of it.

Miss K. Gorringe records a new locality for *Chrysosplenium oppositifolium* at Rempstone and several plants of *Primula variabilis* Goupil (*P. veris x vulgaris*).

Miss Penrose shewed *Hammarbya paludosa* Kuntz (*Malaxis*) in an easily accessible position, new to most, near Picket Post.

Centaurium capitatum Willd. and *C. pulchellum* Sch. were again identified on the downs near Swanage and *Silene nutans* near Old Harry Rock.

Miss K. Gorringe records the following: a large plant of *Glaucium flavum* at Redhorn; *Rhynchospora fusca* increasing near Scotland Farm and in many places on Slepe Heath: *Scorzonera humilis* and great increase of *Parentucellia* (*Bartsia*) *viscosa*: many huge clumps of *Phalaris canariensis* on Stanpit dump: *Cynodon dactylon* increasing on East Cliff, Durley and Middle Chines, Sandbanks and Poole: *Mitbora minima* in abundance at Ferndown: an enormous plant of *Hyoscyamus niger* and also plenty of *Tillaea muscosa* and *Trigonella ornithopodioides* by the old railway track at Hurn.

Numerous additions are being made to our Herbarium through the bequest of the fine collection made by the late Mrs. E. Rothwell and many duplicates are being made available to members.

The Section thanks all Lecturers and Leaders of Field Meetings.

E. CHAMBERS.

Entomology

The appearance in the Spring (1952) of *Pyrameis cardui,* The Painted Lady, was much earlier than usual. This has given rise to the old question as to whether it is possible for this butterfly to survive a mild English winter or if we must depend on immigration for its presence in this country.

The illustration in the "Radio Times" of August 1st of the larva of *Sphinx ligustri* (The Privet Hawk Moth), has brought me a number of reports that this caterpillar has been common in Bournemouth gardens this year.

I still receive many enquiries as to the best way to check the ravages of Woodworm. My own experience is that "Rentokil" is a most useful antidote.

On several of our excursions this summer when we have disturbed recumbent Butterflies, I have been asked if they can hear? The answer is that they have no ears and cannot hear. They can, however, feel tremors through their feet and are less sensitive to the appearance of a human being than to the vibrations they produce.

W. S. I. COX.

Geography

Last season lectures were mainly held conjointly with the Photographical Section; these numbered twelve, one only being Geographical. Field Meetings numbered eight, one being held conjointly with the Geological Section. The Meetings covered a somewhat wider field. The attendance has not been quite as numerous this year. Mr. Woodhouse and Mr. Bailey kindly led excursions during the absence of the advertised leader.

H. DE CASTRO.

Microscopy

A full programme of monthly lectures on subjects demonstrated by the microscope, was carried out during the winter session, and thanks are due to those lecturers who assisted. The Chairman delivered the section's evening public lecture in March, the subject being "The Microscope for Leisure and Pleasure."

During the winter, a course of seven short classes on Elementary Microtechnique was taken by the Chairman, and Dr. Wray kindly undertook the demonstration of the preparation of geological mounts.

The section's collection of microscope slides has been augmented during the year by the generous gift of a slide cabinet, containing nearly one thousand slides of assorted natural history subjects, from Mrs. Morton Robertson.

J. H. MURGATROYD.

Photography

This section again joined with the Geographical section in presenting two lectures per month. Due to illness the lecture originally arranged for March 1st could not be given and Commander Beamish of the Lymington Field Club agreed to show and comment on his Colour Cine Films of India. The lecture on "Karen Adventure," by Peter Almack, in January, described a trans Atlantic voyage in a small yacht. For these memorable contributions to our programme we tender our thanks. An interesting innovation was "Snapshot Album" when members commented on their own photographs which were projected by the epidiascope. Major Cooper Hunt was unable to lecture due to illness, but kindly loaned some beautiful colour cine films of his own taking. We hope his lecture may be included in a later programme.

Offers of lectures or demonstrations will be very welcome, particularly by new members.

A. W. LEGAT.

Physics and Chemistry

The Section has contributed to the Programmes in each month from October 1951 to May 1952, inclusive.

Three visits to public service and industrial plants were made by parties which in all cases had to be limited only by the numbers accepted by the authorities themselves.

Best thanks are accorded to the two ladies who addressed the Section, Miss D. M. Lowther and Miss E. B. Wood, whose admirable lectures attracted much interest; also to Mr. B. Gorton, for his interesting talk on a hobby subject.

It is hoped that the three lectures under the title of "Some Chemistry for Non-Chemists," may have been useful to members who have attended in the past, and will continue to attend in the future, lectures of a more specifically chemical character.

H. E. CLARKE.

Zoology

During the year under review this Section has delivered ten lectures, some in collaboration with other sections. Numerous outings were arranged throughout the summer, and the fine weather contributed in no small degree to their success.

The local fauna is somewhat limited as regards mammals, consequently ornithology figures very prominently in our activities. Considerably more work might be undertaken in the study of reptiles and fishes.

It is hoped that members will endeavour to make careful records of any interesting observations whatever the field, with full data, in order that particulars may be included in the "Proceedings"; and that any unpublished material may be filed for future reference.

Nature notes are specially solicited, and the necessity for them cannot be sufficiently stressed.

SUMMARY OF OBSERVATIONS.

Mammalia.

Badger (*Meles meles*). Seen at Bloxworth by Mr. and Mrs. Belcher, E.B., M., H.A.W. and others.

Fox (*Vulpes canis*) observed with cubs near Poole by U.M.O. and V. du B.S.

Yellow-necked Field Mouse (*Apodemus flavicollis*). E.C.

Water Vole (*Arvicole amphibious*). In the Bourne near Pavilion, between the last two bridges; early in January 1952. F. Williamson.

Aves.

K.G. observes Marsh-Tit (*Parus palustris dresseri*), Hinton Admiral 11.12.51, and a flock of Wood Lark (*Lullula arborea*) in Meyrick Park Golf Course 22.12.51. Raven (*Corvus corax*) 18.3.52.

Brig. Venning reports two Montague's Harrier (*Circus pygargus*), one by E.C. who also notes the Little Ringed Plover (*Charadrius dubius curonicus*) as nesting near Barton; two eggs of which (addled) he has kindly presented to the museum, also one of *pygargus*. J.C.C. saw the Black Tailed Godwit (*Limosa limosa*), Whimbrel (*Numenius phaeopus*), Curlew (*Numenius arquata*), Knot (*Canutus canutus*), and a large flock of Ring Plover (*Charadrius hiaticula*), all at Stanpit on August 17th.

A pair of Spoonbills (*Platalea leucorodia*) were seen at Abbotsbury, together with a pair of Garganey (*Anas querquedula*), and a pair of Teal (*Anas crecca*), all by Mrs. B.R.D.

Hoopoe (*Upupa epops*) seen 17.4.52 in the garden of Well House, Wick, by Mr. Russell and reported in "Bournemouth Daily Echo" 21.4.52. Two were also seen at Ulwell, Swanage, next day; and again at Godlingstone Farm, Swanage, by Master A. J. Beale.

Osprey (*Pandion haliaëtus*) seen at Ibsley on April 12th, 1952, by Col. Dewey and Singer (River Keeper) independently, on the Normanton Estate.

Miss Christine Popham has kindly contributed the following list of migrants and other birds embodied in a special report.

BIRD RECORDS, 1952.

Special Report by Miss C. Popham.

Among the most interesting records received this year are those of a pair of Spoonbills on Stanpit Marshes on May 16th (A.E.P.); an Osprey seen at Ibsley, April 12th by Mr. W. J. Read; the Osprey was also seen by Mr. Singer, the River Keeper, and by Colonel Drury.

A Hoopoe was seen on Hengistbury Head on April 13th by Mr. and Mrs. Owen and another (probably the same bird) was seen in a garden at Wick on April 17th by Mrs. Russell of the Well House, Wick.

Mr. J. C. Crawshaw reported that a Pintail Duck was shot on or about December 12th, 1951, in Christchurch Harbour. The bird was wearing a ring dated about ten days previously in Newfoundland.

A Merlin was seen near West Wellow on October 2nd, 1951, by C.P. and V.G.

Major Hathorn reported a Golden Oriole on the estate of Avon Tyrrell on May 26th.

Dartford Warblers well on the increase, one pair on St. Catherine's Hill (J.C.) at the end of May. Three pairs bred in the vicinity of Thorney Hill (C.P.).

Shelducks returned to Stanpit Marshes on January 10th, and the first brood seen at Stanpit, May 16th (J.C.).

Ravens reported on St. Catherine's Hill and Stanpit in April (J.C.).

Mrs. Churches reported seeing forty-one ringed Plover and one Dunlin feeding with a number of Skylarks in a cornfield close to the motor road on Hengistbury Head on January 31st.

Several pairs of Woodlarks, presumably nesting, in grounds of Avon Tyrrell (C.P.).

Curlew apparently nesting at Dur Hill, near Burley (C.P.).

A Peregrine was seen flying up the River Avon on February 11th near Lower Kingston (F.M.P.).

Cock Montagu Harrier watched near Buckler's Hard on April 22nd (F.M.P.).

Arrival of Migrants, 1952.

Wheatear. March 8th (J.C.), Stanpit Marshes. March 9th (A.E.P.), Highcliffe. March 12th (Mrs. Churches), Stanpit. April 1st (C.P.)., Stanpit.

Chiffchaff. March 16th (C.P.), Thorney Hill. March 20th (F. & M.P.), Poulner.

Lesser Black Back Gull. March 23rd (C.P.), Stanpit.

Willow Wren. April 6th (C.P.), Thorney Hill.

Swallow. April 8th (C.P.), Thorney Hill. April 8th (F. & M.P.), Thorney Hill.

Cuckoo. April 9th (F. & M.P.), Avon Tyrrell. April 12th (C.P.), Avon Tyrrell.

Sedge Warbler. April 13th (C.P.), Avon Valley. (M.P.), High Town.

Blackcap. April 14th (C.P.), Thorney Hill. April 21st (F. & M.P.), High Town.

Nightingale. April 16th (F. & M.P.), Cranborne. April 17th (C.P.), Thorney Hill.

Sand-Martin. April 20th (C.P.), Avon Valley.

Yellow Wagtail. April 10th (F. & M.P.), Winchester. April 23rd (C.P.), Stanpit.

Lesser Tern. April 23rd (C.P. and J.C.), Stanpit.

Whitethroat. April 17th (F. & M.P.), Ringwood. April 25th (C.P.), Bransgore.

House-Martin. April 8th (F. & M.P.), Christchurch. April 26th (C.P.), Christchurch.

Swift. April 23rd (F. & M.P.), Ringwood. April 26th (C.P.), Bransgore.

C. Sandpiper. April 27th (C.P.), Stanpit.

Reed-Warbler. April 27th (C.P.), Stanpit.

Wood-Warbler. April 19th (F. & M.P.), High Town. April 30th (C.P.), Bransgore.

Turtle-Dove. April 30th (C.P.), Thorney Hill. May 1st (F. & M.P.), Ringwood.

Common Tern. May 10th (C.P.), Stanpit.

Spotted Flycatcher. May 10th (C.P.), Thorney Hill. May 10th (F. & M.P.), Ringwood.

Whimbrel. April 22nd (F. & M.P.), Beaulieu. May 3rd (C.P.), Stanpit. May 5th (A.E.P.), Stanpit.

Garden-Warbler. May 14th (C.P.), Bransgore.

Whinchat. April 22nd (F. & M.P.), Brockenhurst.

Nightjar. May 11th (F. & M.P.), Ringwood. May 26th (J.C.), St. Catherine's Hill.

Tree Pipit. May 13th (C.P.), Bransgore.

R.B. Shrike. May 20th (C.P.), New Forest.

Code for Initials.

J.C. = Mr. J. C. Crawshaw.
V.G. = Miss V. Goodwin.
A.E.P. = Mr. A. E. Pole.
F. & M.P. = Misses F. and M. Penrose.
C.P. = Miss C. Popham.
E.B. = Miss E. Banham.
B.R.D. = Mrs. B. R. Dunn.
U.M.O. = Miss U. M. Ogle.
K.G. = Miss K. Gorringe.
M. = Mr. and Mrs. Marsh.
H.A.W. = Miss H. A. White.

Note.—"The British Birds Reading Circle" is still being carried on, and is now under the management of Miss N. Watts.

CHRISTINE POPHAM.
V. du BÉDAT SMYTHE.

Presidential Address

Origin of Hampshire

By F. Williamson, F.R.Hist.S.

(*Delivered before the Society on October 25th,* 1952).

Maps of the British Isles show that both the main islands, Great Britain and Ireland, are divided into small portions, which on coloured maps look exactly like patch-work, the divisions being irregular in shape and varied in size. These areas are known as shires or counties, and they represent units of government immediately below parliamentary government, in other words there is no regional or provincial administration between government and shire.

On the face of it, it looks as if at some time in the past the whole of the British Isles had been cut up into discrete portions in order to facilitate the government of the country as a whole, whereas in fact the system (if it can be called a system) grew up bit by bit, and from time to time, without any regard to the future, and it was only through its adaptability to changing circumstances that the shire system survived and spread over the whole Kingdom. So successful was the system that in 1888 parliament passed a Local Government Act which, among other things, gave greatly increased powers to County Councils.

Examination of the history of our English shires shows that some of them represent old kingdoms, like Sussex and Essex, territories of the South Saxons and East Saxons respectively. Others, such as Surrey and Northumberland, are remnants of larger kingdoms, while Norfolk and Suffolk represent the two halves of the ancient kingdom of East Anglia. Most of our shires, however, take their names from their county towns, others like Hampshire from a town not the county town, while in some cases the name is derived from another source, e.g., Devonshire, Berkshire. It would be thought that such an important subject as the origin of our shires would have been effectively dealt with from the historical point of view, especially seeing that the system is a live one, but so far as I know there is no work which deals adequately with the subject.

The purpose of this paper is not to deal with the problem of shires in general, but, in particular, to try to elucidate the origin of Hampshire, chiefly because that shire was the first to be named in records of any kind, more than one hundred years before any other shire is mentioned, and was the model on which later shires were organized.

In order to get a clear idea of our problem we shall have to define the meaning of our terms "shire" and "county," to consider the English invasion of Britain, particularly as it occurred in Wessex and Sussex, and to find, if we can, the original local administrations, which preceded that of the shire system. The two terms "shire" and "county" are now practically synonymous, but this was not always the case. In actual names, "shire" enters into the compound term, while in some cases county is used, as in "County of Durham." Even "County of Southampton" is used instead of Hampshire by some government departments, in census returns, for instance, figures relating to our area must be sought in the alphabetical list under "S," and not under "H." "County" is derived from Anglo-Norman *counté,* O. Fr. *conté,* from Latin *comitatus,* and means a district governed by a count. It was introduced into English by the Normans to describe the territorial division already in existence, and known by the English term "shire." It is unnecessary to point out that the title of "count" has never been current in Britain, and that strictly speaking the use of the word county is not historically justified.

The word "shire" on the other hand comes down to us from early in the Saxon period, and occurs in the laws of Ine, who was king of the West Saxons for thirty-eight years from 688 to 726. The following translations from Ine's laws show the early use of the word :—

" 36—He who takes a thief or has a captured thief given over to him, and then lets him go, or conceals the theft, let him pay for the thief according to his *wer.* If he be an ealdorman let him forfeit his shire, unless the king be pleased to show him mercy."

" 39—If any one go from his lord without leave, or steal himself away into another shire, and word is brought, let him go where he was before, and pay his lord 60 shillings." (1)

This shows the word in use before any of our present shires had been mentioned by name, and clearly indicates its true meaning. Many of our older historians, like Stubbs, in his well-known *Constitutional History* (2) thought that "shire" meant a "share" or sub-division of a larger unit, a kingdom, and this erroneous idea is still occasionally met with, for example, Sir John Marriott, *This Realm of England,* 1938 (p.38), says, "The word 'shire' merely signifies the division of a larger entity." The late Prof. W. W. Skeat, writing in *Notes and Queries,* June 1912, says, "I was rather surprised to meet with the survival of the old fable 'shire' means a 'share', and is derived from the verb *to shear.* It is a survival from Todd's 'Johnson', but shire has no more to do with share, than fire has to do with fare, or hire with hare."

If we consult the Oxford English Dictionary, or the etymological dictionaries of Skeat or Weekley, we learn that "shire" is the modern form of O.E. *scīr,* "care, official charge", the same as O.H.G. *scîra* with the same meaning, and is cognate with the Latin *cura,* which represents O.Latin *coira,* probably shortened from *scoira,* also meaning "administration, care, charge." It will be seen that this fits the use of the word in Ine's laws.

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(1) Earle, J. *Anglo-Saxon Literature,* pp. 151-2.
(2) Vol. 1, p. 109.

It is quite true that shires are generally smaller than kingdoms, but some consist of the whole territory of a kingdom, e.g. Kent, Sussex and Essex, and we should cease to think that shires originated in a deliberate decision to divide large territories into smaller units.

We can now consider the English settlement of Britain, and for this there is no concise description that can better that of Bede, written as long ago as 730 A.D. For our purpose part of the translation in Sir Frank Stenton's *Anglo-Saxon England,* 1943 (p.9) will suffice.

"They [the English] came from three very powerful nations of the Germans; that is, from the *Saxones, Angli* and *Iutae.* Of the stock of the *Iutae* are the *Cantuarii* and *Uictuarii;* that is, the race which holds the Isle of Wight [*Vecta, Wiht*], and the race in the country of the West Saxons, which is still called *Iutarum natio,* established over against the Isle of Wight. From the *Saxones,* that is, from the country now called the land of the Old Saxons, came the East Saxons, South Saxons, and West Saxons. From the Angli, that is, from the country called *Angulus,* which is said to have lain deserted from that time to this between the countries of the *Iutae* and *Saxones,* are sprung the East Angles, Middle Angles, Mercians, the whole Northumbrian race—that is the people living to the north of the River Humber—and the other peoples of the Angli."

The Anglo-Saxon Chronicle, first laid down in its extant form in Alfred's reign, summarises Bede's account; the section of most interest to our purpose reads : "From the Jutes [Iotum] come the *Cantwara* and the *Wihtwara.* They are the people who now live in Wight [Wiht] and the people in West Saxonland now called *Iutna cynn.*" The Chronicle gives 449 as the year of the first arrivals.

The only adjustment that can be made to the foregoing accounts of the English invasion is that all the three nations had already moved west of their original homes in Europe before the actual invasion took place, and that probably the Jutes had moved the furthest west, perhaps to the mouths of the Rhine, and so had come nearest to the English coast, and into contact with the higher culture of the Rhineland.

Having seen that the English who actually settled in the Isle of Wight and the adjacent coast were Jutes and not Saxons, we can go on to consider the details of the invasion as recorded in the Anglo-Saxon Chronicle, which records no fewer than three different invasions of the Hampshire coast, and one of the adjacent Sussex coast. Before turning to the Chronicle, a glance at the coastline for possible landing places would be advisable.

Proceeding from west to east, there is Christchurch Harbour, Lymington estuary, Beaulieu estuary, Southampton Water, with the Hamble estuary on the east shore, then the vast expanse of the enclosed harbours of Portsmouth, Langstone and Chichester, with three narrow mouths, and all the harbours connected by narrow channels at their northern ends, each running inland some four or five miles—an ideal coast-line for a hostile invasion in small ships. What actually makes the separate harbours is the presence of two large islands, Portsea and Hayling, and another fairly big one, Thorney, in Chichester Harbour. It should be noted that the Romans had settlements at the head of Southampton Water at Bitterne (Clausentum), at Portchester (Portus Adurni) at the northern shore of Portsmouth Harbour, and at Chichester (Regnum), showing that these practical people appreciated the facilities afforded by this coast. At Portchester the Romans built a strong fort about the end of the third century A.D., as a protection against raids by bands of Saxons, which had already begun. This by the way is the best preserved of the nine "forts of the Saxon shore."

According to the dates given in the Chronicle the invasion of the Sussex coast took place some eighteen years or more before the Hampshire coast was invaded, but the actual chronology of the invasion is perhaps the most difficult part of the story to accept.

The Chronicle tells its story in short paragraphs, each preceded by a date, and under the year 477 we learn that Ælle came to Britain with his three sons Cymen, Wlencing and Cissa in three ships at a place called *Cymenes ora* and there slew many Britons, and drove some into the wood called *Andredes leag*.

Ælle, according to Bede, became the first Saxon Bretwalda ("Britain Ruler") and was the first king in this country of the South Saxons. Cissa gave his name to Chichester, and his ship may have made its landfall in Chichester Harbour. At any rate Cymenes ora must be the *Cumeneshora* mentioned in a later Sussex charter, and now, owing to coast erosion, represented only by Owers Bank, off the west coast of Selsey.

Wlencing's name is preserved in the place-name Linchmere, and perhaps in Lancing, both in Sussex. So this annal represents a substantial tradition, and only the date and the number of ships are open to doubt. It will be seen that the South Saxon invasion took place at the extreme western boundary of Sussex, and it seems reasonable to suppose it was tied up with the invasions of the Hampshire coast.

The accounts of the latter as given in the Chronicle are three and vary from each other. First under the year 495 we are told that two chiefs came to Britain in five ships, Cerdic and his son Cynric, at a place called *Cerdices ora,* and they fought with the Britons the same day. Here we have a reflection of the Sussex story, the place of landing being named after one of the leaders, but in this instance the place is not heard of again. However, the landing may have taken place at the head of Southampton Water, where not far from the River Test is a village still called Ower. On the other hand it may have been at the S.W. corner of Southampton Water where there is another place called Ower, 1½ miles south of Fawley, while at the entrance to Beaulieu Estuary is Needs Oar Point, all three names derived from O.E *ora*, which means 'a bank or shore.'

Whatever uncertainty there may be about their origin, Cerdic and Cynric certainly became the first kings of the West Saxons in this country. First Cerdic and then Cynric ruled, the latter until 560. Furthermore they were recognised as ancestors by later kings. In 519 they are said to have "taken the kingdom", that is of the West Saxons, and in the same year fought with the Britons at Cerdices ford, a place on the River Avon, still called Charford or Chardford, close to the western boundary of Hampshire, and only six or seven miles south of Salisbury. The genealogy of the two founder kings has been preserved in the Chronicle (under 552), where seven generations before Cerdic take the pedigree back to Woden, the mythical ancestor of all English royal families except that of the East Saxons.

The grandfather of Cerdic was named Gewis, and so the royal family of the West Saxons, called themselves *Gewisse,* in the same way as the royal family of Kent were *Oiscings,* of Mercia *Hickelings,* of East Anglia *Wuffingas,* and so on. It has been suggested that Gewis was invented to account for the name Gewisse, but it seems strange that Cerdic should not have known the name of his own grandfather.

In 508, the two leaders are said to have fought with the Britons, and to have slain a British king called Natan Leod and five thousand men with him, and that afterwards the land was called *Natan leaga* as far as Cerdices ford. Natan leaga is represented on the present map as Netley Marsh, near the head of Southampton Water, and not far from Ower previously mentioned. It means 'the wet woodland', and may have been more extensive than nowadays.

Under 501 we get details of another invasion. This time Port and his two sons, Bieda and Maegla are said to have landed in two ships at a place called *Portes Mutha,* and killed a young British man, 'a very noble man'. Here there seems to be no doubt about the place of landing, although some historians think that the name of Port was invented by the chroniclers to account for the name of Portsmouth. This can hardly be the case, for at the time the Chronicles reached their final form Portsmouth town did not exist, and it is not until six hundred years after the date of this arrival, i.e. in 1101, that Portsmouth is mentioned in any document whatever. When the Domesday survey was made in 1086 only three places are named on Portsea Island, Buckland, Copnor and Fratton. Portsea is the island on which Portsmouth lies, and is mentioned in a charter of 982 as *Portesig*, and it may well embody Port's name. The only likely place for a landing in 501 was at Portchester, on the mainland. That the personal name Port could enter into place-names is shown by the names Portslade in Sussex and Portesham in Dorset (1), and several other names. The names *Bida* and *Maegla* have both been found in Sussex place-names, which establishes another link between the counties.

Still another invasion of our coast is recorded under 514. This is a difficult annal to interpret, and the translations of Mr. J. L. Myres (2), and Sir Frank Stenton (3), differ somewhat. What is clear is that two new leaders are mentioned, Stuf and Wihtgar, and that they fought with the Britons. The annal makes it appear as if the two leaders were West Saxons, whereas we know, on the irrefutable evidence of Bishop Asser, King Alfred's biographer and friend, that they were Jutes, and the founders of a noble family. Thus King Alfred's mother, Osburg, was the daughter of Oslac, butler of King Æthelwulf, Alfred's father, and Asser says he came of the family of Stuf and Wihtgar, and belonged to the same 'Gothus et Jutis' nation.

Through this union of a West Saxon king with a descendant of the Jutish family of Stuf and Wihtgar our royal family can claim descent from two races who took part in the early English invasion of Hampshire.

The Chronicle does not enlighten us as to the districts settled by Port and his followers, and by Stuf and Wihtgar, but we know from Bede that the Isle of Wight, and the territory east and west of Southampton Water, was settled by Jutes. If Port's men landed anywhere near Portsmouth Harbour they would form the nucleus of the folk who were later known as the *Meonwara*, the people living in the valley of the river Meon. There are two garbled references to the Isle of Wight under 530 and 534, in which Cerdic and Cynric are credited with the capture of the island, and with having given it to their nephews, Stuf and Wihtgar. When they took the island they are said to have slain a few men at *Wihtgarasbirg* or *Wihtgarabyrig*, now Carisbrooke, which was Wihtgar's fort on the island, and must have been in his hands long before its supposed capture is said to have taken place. Some doubt has been thrown on the authenticity of Wihtgar because of similarity to the name of the inhabitants of Wight, *Wihtwara*, but it is a well recorded name, and Wihtgar himself must have been an important man, for we seem to get an echo of his name in a seventh century document known as the Tribal Hedage, where the people of Wight are listed as the Wihtgara.

On the west side of Southampton Water the territory of the Jutes must have extended to and included the valley of the River

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(1) *Place-names of Sussex*, Vol. 2, p. 289. (2) *Oxford History of England*, Vol. I, p. 458. (3) *ibid*. Vol. 2, p. 20.

Avon, as far north as Charford, which is the present boundary; the portion extending westwards beyond the Avon opposite Breamore was only transferred from Wiltshire in 1895. It is thought that the relics found in a cemetery at Harnham immediately south of Salisbury, were Jutish in character. The Anglo-Norman historian, Florence of Worcester, writing about 1125, says that William Rufus was killed in the New Forest, which in English is called *Ytene*. According to Sir Frank Stenton this word represents the genitive plural of the nominative *Yte,* which is the late West Saxon form of Bede's *Iutae*. It is clear therefore, that the inhabitants of this area must have preserved a knowledge of their origin through many generations.

On the eastern side of Southampton Water, Bede says that the River Hamble was in the territory of the Meonwara, and we know that Southampton was the chief town of the Jutes. That Jutish territory extended some miles north of Southampton is shown in a charter of 960 relating to Bishopstoke, in which it is called *Ytingstoke,* which means "the place of the Jute people", and contains the same root as *Ytene*. There is no doubt this charter belongs to Bishopstoke and not to Itchen Stoke, for in a charter of 901, concerning Durley (the next parish to Bishopstoke) are two very peculiar boundary marks mentioned in both charters.

It is clear that the Jutes had occupied the Isle of Wight, and the adjacent mainland as far west as the present boundary with Dorset, taking in the fertile valley of the Avon, and eastwards to their boundary with the South Saxons, while inland the valleys of the Meon and the Hamble were included in their territory. Winchester, however, appears to have been unoccupied by them, for here Cerdic and Cynric made their chief settlement, and Bede tells us that Winchester was in the country of the Gewissae. Where then were the West Saxons? They were without doubt, those tribes which at an early date settled the middle reaches of the Thames. To a people in this situation the name was an obvious one, as from east to west, we find the East Saxons in Essex, the Middle Saxons in Middlesex, and further up the Thames the West Saxons. In their territory, and at Dorchester in Oxfordshire in particular, some of the earliest cemeteries of the invasion period have been found, dating back to the middle of the fifth century. According to Mr. E. T. Leeds, the West Saxons reached their territory not overland across Hampshire, but from the north-east along the line of the Icknield Way, from the estuary of the Wash, though many of them may have come by way of the Thames itself. In any case they occupied Berkshire and the southern part of Oxfordshire, and the valleys of the tributaries of the Thames flowing north from Hampshire. When Cerdic and Cynric took the Kingdom, they made themselves masters of the West Saxons, who do not appear to have had a royal family of their own.

For more than a century after the invasion, the Jutes, the Gewissae and the West Saxons remained heathens, and it was not until 634 that a missionary, Birinus, came from the continent. His original purpose was to convert the Mercians, who occupied the whole of middle England, but having presumably landed on the Hampshire coast, Bede says he found himself in the land of the Gewissae. Finding them to be heathens he decided to try to Christianize the West Saxons; and it is significant that he fixed his seat at Dorchester in Oxfordshire, not at Winchester, as is sometimes suggested. There the bishop's seat remained until 661, when Wulfhere, king of the Mercians, defeated the West Saxon king Cenwalh, and annexed all his territory north of the Thames, so that Dorchester became a Mercian See.

All this time the Jutes had remained heathens and when the See was moved to Winchester about 662 they were still unconverted. Wulfhere had handed over the Isle of Wight and Jutish mainland to Æthelwalh, the South Saxon king, and it was not until 686 that they were converted. About this time Caedwalla, who only reigned for three years over the West Saxons, attacked the Isle of Wight, and in his anger at their allegiance to the South Saxon king, tried to exterminate the Jutish inhabitants and to replace them by West Saxons. Fortunately he appears not to have been successful, for he abdicated and went to Rome in 688 when Ine succeeded him as king.

We have now reached a position in which the Jutes are settled in the southern part of Hampshire, the Gewissae in the central part and the West Saxons northwards and up to the Thames, with Gewissae providing kings and governing the whole of the south-west down to, and, in parts beyond, the present boundary between Devon and Cornwall. But, as yet, not a single shire had been mentioned by its modern name. It can be surmised from Ine's laws that the shires were not territorial divisions as we know them, but areas whose inhabitants called themselves Dornsaete, Wilsaete, Sumorsaete and the Defena, each with their own alderman, and owing allegiance to the West Saxon kings. It was the extended territories of these peoples that formed the later and larger shires.

It is not until 757 that a shire is mentioned under its modern name, when in the Anglo-Saxon Chronicle under the year 755 occurs the following story: Sigeberht became the West Saxon King in 756, but reigned only for one year; then Cynewulf and the Witan deprived him of his kingdom except *Hamtun scyre,* for his wrong doings, and Cynewulf became king.

Sigeberht later slew the ealdorman who had been with him the longest time, and Cynewulf drove Sigeberht into Andred, a wild woodland which extended from Kent, through Sussex into Hampshire, and he abode there until a swain stabbed him at *Pryfetes flód*, and revenged the ealdorman Cumbra. The Chronicle story reads as if all this took place in a very short time, but it may really have covered a long period for in 786 Cyneheard, a brother of Sigebehrt, slew Cynewulf in revenge for the death of his brother, which seems a long delayed revenge.

This account clearly shows that in 757 Hampshire did not include Winchester, then the West Saxon capital, from which Sigeberht was banished into Hampshire. Privett, where Sigeberht was slain, is only three miles north-east of West Meon, and presumably was in the territory of the Meonwara.

Our shire remained *Hamtunscir* down to the beginning of the 11th century, when the name began to clash with the Mercian shire of the same name, and it became Southamtonshire for a time, and the other Northamptonshire permanently. The present contraction commonly used, Hants, can be easily accounted for. First, the unstressed letter *n* disappears, and a form like *Hamtescira* appears, and in Domesday we get *Hantescire,* a spelling due to Norman scribes, giving a contraction much easier to pronounce than "Hamts."

We can conclude our survey with a brief account of the earliest appearances in records of other West Saxon shires. Berkshire is first mentioned in 860 as *Bearrucscir,* a name derived according to Asser from the name of a wood and not from an inhabited place, which is unusual. Curiously enough Devonshire, which was not added to the West Saxon kingdom much before the end of the 7th century, is mentioned as *Defenascire* in 851, *Wiltunscire* in 898, *Dorseteschire* in 940, and *Sumersetescir* in 1122. In all earlier references to these districts the tribal names of the inhabitants were used.

It is probable that the boundaries of the West Saxon shires became fixed by the end of the 8th century and have retained those boundaries, with minor adjustments, down to the present day. There was a wide-spread rectification of boundaries in 1895 all over England, usually straightening and doing away with islands.

Modern alterations of shire boundaries apply only to civil administrations and not to ecclesiastical, so that portions of Bournemouth are in the diocese of Salisbury, while the rest is in Winchester.

There is one type of evidence indicative of early settlement on which I have not touched, viz. the evidence of place names, and this shows that the coast of Hampshire became settled at an early date. It is generally agreed that names ending in *ing* are the most ancient of all English place-names. They represent the names of small tribal units, who took their tribal names from their leaders, or from some topographical feature of the place in which they settled, adding to such name the element *ingas,* which signified 'the people of.' Names of this type are most common along the shores of the great southern harbours and near the north end of Southampton Water. In the Selsey peninsular is Wittering, 'the settlement of Wihthere's people.' One mile to the east, this time in Hampshire, is Hayling, the old name of which signified 'the island of Haegel's people,' and just north of Portsmouth Harbour lies Wymering, 'the settlement of Wigmaer's people.' At the head of Southampton Water, we find Eling, 'the settlement of Edla's people,' Nursling, 'the Nutshell people,' and Swaythling, 'the people of the swath or track.' In the neighbourhood of Charford are two other names of an early type, Ellingham, 'the settlement of Edla's people,' perhaps a branch from Eling, and Fordingbridge, originally *Fordingabrig*, 'the bridge of the people of the ford.'

The foregoing represent small tribes who made up the large groups of the Jutes (the Meonwara, the Yte and the Wihtwara) and it was the combination of these smaller and larger units together that cemented them into a shire as one administrative area, under the immediate government of an ealdorman. The settlers in the southern part of our county, under their different local names, all considered themselves to belong to the nation of the Jutes, and what could be more reasonable than that they should have their own tribal government under a member of their own noble family, an ealdorman, which, as we have seen, they still had in Alfred's time.

Instead, therefore, of thinking that Wessex was cut up into shires, we should think of it as having been built up out of shires, firstly those of the Jutes, the Gewisse, and the West Saxons, to which were later added the Wilsaete, the Dornsaete and the rest.

Postscript.—Since the foregoing was written Mr. O. S. G. Crawford has published an interesting paper in *Antiquity* for December, 1952, entitled "Cerdic's Landing Place"; in which he argues for Ower, south of Fawley, and in support he mentions the existence of certain earthworks which more or less enclose this area.—AUTHOR.

The Causes of Metamorphosis

By H. BURY, M.A., F.G.S., F.L.S.

(A Lecture delivered on January 19th, 1952).

The word "Metamorphosis" means literally "change" or "transformation", but it is used to describe changes of very different degrees; and entomologists distinguish between "complete" and "incomplete" metamorphosis. As an example of the latter we may take the grasshopper. When it comes out of the egg it is already very similar to the adult, except in two points; it is much smaller, and it has no trace of wings. But after a few moults small rudiments of the wings appear, and these grow at each change of the skin, until finally the adult stage is reached and the wings are fully developed. It is apparent that this incomplete metamorphosis is a trifling affair compared with the change from a caterpillar to a chrysalis, and a chrysalis to a butterfly. In fact it hardly seems worthy to be called a metamorphosis at all.

LEPIDOPTERA.

But that is unimportant, for we shall deal to-day only with complete metamorphosis, which occurs not only in several orders of insects, but in other animals as well. Let us take first the well-known case of the Lepidoptera (Butterflies and Moths) and ask how their very elaborate metamorphosis can have been evolved. Most biologists believe that the main factor in evolution has been the natural selection of favourable variations, or, as we now call them, mutations. But how did this lead to metamorphosis? There must have been a long series of such mutations, and many of them must have been in some way advantageous, or they would have been eliminated very soon by natural selection. But how can a series of mutations have been favourable which led up to a helpless creature like a chrysalis, which cannot see, or feed, or move from place to place? That is our problem; but before trying to solve it, we must turn for a moment to another aspect of evolution.

Darwin showed that embryos and larvae often exhibit features which may reasonably be interpreted as throwing light on ancestral stages; and this idea was later expanded by Haeckel into the "Recapitulation Hypothesis", according to which an animal, in its individual development, recapitulates, more or less, the evolutionary stages of its ancestors; or to use some convenient technical terms, the "ontogeny", or life history of the individual, repeats the "phylogeny", or ancestral history of the race. One can get a good idea of this from the frog, for the tadpole is virtually a fish, swimming by means of its tail, and breathing by gills; we have no doubt that frogs are descended from fishes, and that the tadpole repeats some of the ancestral characters. Usually, however, recapitulation is so fragmentry and confused that it can scarcely be said to exist at all.

Later on some cases will be given in which the larvae, before metamorphosis, seem to retain a fair number of ancestral features; but in insects, with which we are at present concerned, this is not the case. The grasshopper, when it emerges from the egg, is already definitely an insect, and gives no clue to the ancestors of that group; while in the Lepidoptera the larva (caterpillar) has undergone a number of adaptations to fit it for a special mode of life, and in doing so it has actually lost some of the distinctive features of a typical insect. These adaptations in fact obscure the phylogeny to such an extent that in some respects the adult is more primitive, that is, more like an ancestral insect than the larva.

It is a primitive characteristic of insects that the body is divided into three parts, the head, the thorax, and the abdomen: in fact it is from this creature that the name "insect" is derived; for "in-sect" means "cut in", and one can well see in the wasp or an ant that there are notches in the outline of the body both in front of and behind the thorax. A moth shows the three parts fairly well, but the caterpillar does not; the head is distinct, the three segments behind the head, which will eventually form the thorax, are similar in shape to the segments of the abdomen, and the abdomen is much longer in proportion than in the adult. In the general form of the body therefore, the larva is less primitive than the adult.

Another characteristic feature of a typical insect is the presence of three pairs of fairly long jointed legs, suitable for walking. And here again the larva is less primitive, for although the paired legs are present, they are rudimentary, and of little use for walking. Caterpillars walk mainly by means of unjointed "prolegs" on the abdomen; and as these prolegs are absent in the larvae of some of the most primitive moths, it is probable that they have been acquired by Lepidoptera to help in locomotion, and to support the greatly elongated abdomen; for no insect which used the jointed legs alone could have supported such a long abdomen.

Another adaptation in the larva concerns the wings. We do not know how wings originated, but in grasshoppers and many other insects they appear as external rudiments in the larva, increasing in size with each moult. In caterpillars however, they are not visible externally, but are tucked away in pockets under the skin, in a way that cannot possibly be primitive, but seems to be an adaptation to protect them from injury.

One other small point may be mentioned. The larva has only simple eyes, called "ocelli", whereas the adult has both ocelli and compound eyes; and these compound eyes are primitive features. It seems therefore that the larva, to suit its mode of life, has lost its compound eyes.

In several points therefore the larva is less primitive than the adult: but it is definitely *more* primitive in possessing jaws, for butterflies have no jaws, and can only feed on liquids, for which they have developed a highly efficient proboscis. This complete change of diet and mode of feeding is an important point, for it will be shown later that some of the most striking cases of metamorphosis in other animals are closely connected with differences in the feeding habits of the larva and adult.

To understand how metamorphosis originated in the Lepidoptera, we must suppose that in their ancestor the form and habits of the larva were very similar to those of the adult, as is the case in the grasshoppers; but perhaps to begin with both larva and adult possessed a primitive sucking apparatus as well as jaws, for we find both these forms of mouth parts in some of the most primitive moths. But in the Lepidoptera these two stages gradually diverged. The larva concentrated more and more on eating solid food, and so promoting rapid growth; while in the adult food was not so important, as there was no more growth, and its life is comparatively short. So it used its wings to fly about and find a mate, while sucking honey from the flowers through its highly evolved proboscis.

If our ideas of evolution are correct, this divergence between the larva and the adult must have begun slowly and progressed step by step by means of a series of mutations, extending probably over several million years; and we could not expect to find all these mutations repeated in the lifetime of the individual. What was therefore an immense series of changes in phylogeny has to be compressed in ontogeny into a few months, or even days; and it is this compression which leads to metamorphosis. For it is only in the pupa that the necessary changes from the larva to the adult can be brought about. The change in feeding habits necessitates not only the suppression of the jaws and development of the proboscis, but it requires a complete reorganisation of the alimentary canal. Many other organs, too, have to be reconstructed in the pupal stage, particularly the muscles of the walking legs and the wings; indeed nearly all the larval tissues are completely broken down and rebuilt—one might almost say they are melted down and recast. Obviously while all this is going on feeding is impossible, and so we have a clue as to how the mutations which led up to the helpless pupa became necessary, and acquired that biological utility, without which they would have been quickly eliminated by natural selection.

It has been mentioned that in the most primitive moths (*micropterygidae*) the jaws may be retained in the adult, and they are used for feeding. But here, too, the nature of the food is altered, for the larva feeds on green leaves, and the adult on pollen, while it possesses, besides jaws, a primitive form of sucking apparatus. But even in these primitive moths the change of food is probably accompanied by reorganisation of the alimentary canal, and for this and the building up of the muscles a pupal stage is required.

It is impossible to follow all the stages by which the larva and the adult diverged in habit and structure, but a few suggestions may be helpful. The most primitive living moths are very small. The adults, provided with wings, fly about freely, often in daylight, but the larvae hide during the day, some in crevices in the earth, and others by boring into the centre of leaves, where they feed on the green tissues. But in such confined positions long antennae would be in the way, so they are generally very short in the larvae. Similarly, short legs would be more useful than long ones, and even prolegs would not be wanted, as the larvae only wriggle along like worms. Compound eyes, too, became useless and so were lost; while rudimentary wings would be liable to damage on the surface, and so are withdrawn under the skin.

To sum up, we see that metamorphosis is necessitated by the divergence in habits of the larva and adult; and the further they diverge, the more complete is the metamorphosis. But where the food is much the same throughout life, metamorphosis may be incomplete, even though the external form may be greatly altered. We see this in the Dragon-fly. Both larva and adult are carnivorous, the jaws are much the same in both stages, the legs are long throughout, the wings appear early and increase at each moult, and there is no inactive pupal stage. It is true that change from life in the water to life in the air is spectacular, and the outward appearance is much altered, but the changes in internal anatomy are not very great, and proceed so gradually, that an inert pupal stage is not required. If, however, larva and adult had not been equally carnivorous—if there had been a complete change of food—then an inert pupal stage would have been necessary to allow re-constitution of mouth parts, and metamorphosis would have been complete.

In the Lepidoptera it is fairly easy to imagine the stages by which the larva and adult drifted apart; but complete metamorphosis occurs in many other Orders of insects, and the changes are sometimes very difficult to follow.

STARFISH.

We will now leave the insects, and turn our attention to some cases of metamorphosis in marine animals, in which, unlike the insects, the larvae do seem to throw some light on ancestral conditions.

Let us take first the case of the starfish. There are several forms of starfish larvae, but the only one we shall deal with is called *Bipinnaria,* the name given to it before its true nature was known. It is a very small transparent creature, which swims about freely by means of two bands of cilia. Its anatomy is very simple: it has a mouth, oesophagus, stomach and intestine, and alongside the anterior end of the stomach an organ which we will call the water-vessel; this organ is on the left side of the larva. In the next stage the water-vessel has drifted back towards the hind end of the body, and has developed five lobes, which will eventually become tentacles. Many of the calcareous plates of the future starfish are already seen. In the third stage the water-vessel has moved still further to the posterior end, but is hidden behind a lobed structure, with many calcareous plates, which will form part of the body of the starfish. At this stage the larva usually sinks to the bottom, and fixes itself by its anterior end to a rock or weed.

Then a rapid and remarkable metamorphosis takes place. The larval mouth and oesophagus shrivel up, and a brief period ensues during which the animal can take no food. Then a new mouth is formed at the posterior end, and joins up with the stomach by piercing through the water-vessel, which now becomes the water-vascular ring, with five tentacles. Then the larva breaks away from the object to which it was fixed, and crawls about at the bottom as a young starfish.

It should be particularly noticed that the larva fixes itself by its anterior end, and that the new mouth is formed near the posterior end; while the water-vessel which starts near the front end of the stomach, on its left side, moves towards the posterior end, and the new oesophagus passes through the middle of a water-vascular ring. The animal now loses its bilateral symmetry, and by the growth of the arms acquires radial symmetry. At the same time the arms enormously extend the area for collecting food, and so lead to a great increase of size.

If we had only starfishes to deal with, it would be almost impossible to understand the stages by which this metamorphosis came about, and how much of it—if any—represented an ancestral process. But the starfishes are only one Class out of several which make up the Phylum of Echinoderms; and a study of the larvae in some of the other Classes throws much light on this problem.

CRINOIDS.

So we will pass on to consider the Feather Stars or Crinoids, which are fairly common round our coast, though as they live in rather deep water, they are not widely known. Their minute larvae are bilaterally symmetrical, and swim by means of ciliated bands, but unlike the starfish larvae they are opaque. This is because they contain a kind of yolk, which nourishes them just as the yolk of an egg nourishes a chick. On the ventral surface of the larva there are two shallow depressions. The anterior one is a disc by which the larva will presently fix itself: the other depression may be called the larval mouth, though really there is no mouth at this stage, and the animal lives on the yolk. As this yolk makes the larva opaque, the internal anatomy can only be studied in sections; a section made shortly after fixation shows that the ciliated bands have been lost, and the two sides of the larval mouth have folded in, so as to form a closed cavity, which has already shifted a little towards the posterior end. The stomach is present, but has no connection with the exterior. In the next stage the animal has grown a long stalk, and has straightened itself up. The larval mouth has now moved to the extreme posterior end (taking the point of fixation as the anterior end), and the water-vessel, which has also moved, has developed five pouches which will presently extend into the arms. The larval mouth now opens to the exterior, while an oesophagus is formed which connects it with the stomach, passing through the water-vascular ring. After that the arms grow out, and give the animal radial symmetry, while at the same time they increase the area for collecting food.

When we compare the development of this larva with that of the starfish, we see that, in spite of wide differences in form, they have a number of features in common. In both the young larva is free-swimming and in both it fixes itself by its anterior end. The water-vessel which at first lies on the left side of the stomach, moves to the posterior end, and presently forms a ring round the oesophagus. In both, the bilateral symmetry of the young larva changes to the radial symmetry of the adult after fixation.

From these points of similarity we may draw some tentative conclusions as to the ancestral history of the great group of animals known as *Echinoderms,* of which the starfishes, crinoids, and sea-urchins are examples. These conclusions are of course speculative, we can have no proof of them; but on the theory of evolution they are at any rate plausible. The ancestor of the Echinoderms was probably a small animal, swimming in the sea by means of cilia, and perhaps transparent, like the starfish larva. It would have to be small, for bands of cilia would not be powerful enough to support a large body. Then came the stage when the animal gave up swimming freely, sank to the bottom and fixed itself there. We do not know why this was, but the formation of calcareous plates may have made it too heavy for cilia; and fixation might have been an advantage in a region of strong tides. The mouth was probably not at first in a very favourable position, but this would be improved by straightening the body on the stalk and then very gradually the mouth may have moved up until it stood at the opposite pole to that of fixation. In the Crinoid larva we can actually watch this migration of the mouth, because it does not require at this stage to take any food. But in the starfish larva, which has no reserve of yolk, it is necessary for the larval mouth to go on taking in food until the time comes for the formation of a new mouth near the posterior end of the larva; and this has to be done quickly, to keep the animal from starving.

The metamorphosis therefore is due to a series of revolutionary changes in the ancestral history of these animals. First came the change from a free to a sedentary life; then the mouth migrated to a more favourable position; next the arms grew out, and by increasing the area for the collection of food, allowed of a great increase in size. Finally the sedentary life was abandoned, and the animals moved freely again. This came very early in the starfishes, which appear in the Cambrian strata, but in Crinoids it was comparatively recent, for nearly all the fossil forms, and a few of the living, are stalked throughout life.

BARNACLES.

The next animals we shall consider are Barnacles. Everyone is familiar with the little "acorn shells" attached to rocks between the tide-marks, and many have seen the stalked barnacles which are often fastened to floating timber, or the bottom of ships.

The larval barnacle, however, is so utterly different from the adult that it was long before the connection was recognised. It was named *Nauplius,* and is obviously a Crustacean, closely resembling the larvae of some prawns. It has three pairs of appendages, the front pair being antennae, and the other two are swimming legs. In this stage, too, we see several rudimentary appendages on the abdomen, which later develop into the feathery arms which come in and out of the shell of the adult. Like an insect, the Nauplius sheds its skin several times and after a few moults it suddenly turns into what is called the *Cypris* stage. The antennae bear a pair of suckers by which the larva presently fixes itself, but the two pairs of swimming legs of the Nauplius have disappeared. The rudimentary appendages on the abdomen have developed into six pairs of feathery arms with which the Cypris swims, but it takes no food, and very soon the skin is again changed; then the animal fixes itself by the two discs on the antennae, and the pupal stage is reached. The long axis of the body lies parallel to the plane of fixation; the alimentary canal now lies transversely across the body, and the mouth is directed towards the posterior end, but no food is taken at this stage.

After another moult, the adult stage is reached; the whole body is rotated through an angle of ninety degrees, so that the long axis is now perpendicular. A long stalk is formed, and the mouth, which in the Nauplius was near the anterior end now opens towards the posterior end, as far removed as possible from the point of fixation.

We cannot fail to see here a comparison between the barnacles and the Crinoid larvae. In both there is fixation by the anterior end, and movement of the mouth away from the pole of fixation. Here, too, metamorphosis, with an inactive stage for reorganisation, is necessitated by the great changes in habit and food resulting from fixation.

TUNICATA.

Lastly I will deal very briefly with the Sea-squirts, which are frequently washed up on the shore, attached to stones or sea-weed. They belong to the Phylum Tunicata. All that space allows to be said is that the young larvae swim by means of long tails, rather like minute tadpoles. But very soon they fix themselves by the anterior end, the tail disappears, and the mouth migrates away from the point of fixation, until it comes to rest at exactly the opposite pole.

It is certainly very strange that such widely different organisms as the Starfish, Barnacles and Tunicata should all have larvae which fix themselves by the anterior end, and then rotate the mouth to the opposite end. We believe that in each case the larva more or less repeats an ancestral stage, but a marked change of form follows fixation. And we see how the slow transformation of phylogeny is replaced in ontogeny by rapid metamorphosis, in which the mouth migrates away from the point of fixation.

Hormones: Chemical Messengers

By H. E. CLARKE, M.A., B.Sc., F.R.I.C.

[*A Lecture delivered on March 1st,* 1952 (*abridged*).]

Old-world medicine endorsed the notion of a direct relationship between personal temperament and organic secretion. It recognised four cardinal "humours", generated by the blood, the mucous membranes and the gall bladder. According to the dominance of one humour over the others, an individual's temperament could be sanguine, phlegmatic, choleric or melancholic. There were also less fundamental humours, such as those associated with the stomach, bowels, liver and spleen, which were supposed to influence a subject's manifestations of pride, compassion, fear and anger.

During the last half century a scientific basis has been laid for the relation which exists between glandular secretions and individual physical and mental health. These manifestations are found to depend on the response of the sympathetic and parasympathetic nervous systems, (i.e. what we commonly style the involuntary responses), to chemical agents secreted either continuously, or on stated occasions, by glandular tissue, for the normal needs of a healthy organisation, or in defence mechanisms when healthy conditions are threatened. In the higher animals, a usual characteristic of this sort of secretion is that it is supplied by the endocrine (ductless) glands, from which it is received into the blood stream. In this way the blood may obtain and transport some hundreds of chemical substances, which apparently do not interfere with one another in circulation, but which eventually arrive at destinations where they can elicit specific responses of the highest importance; such transported substances have been called "hormones" (Gr. *hormao*-excite).

It will, however, be apparent that an elaborate adaptation of chemical stimulus to nerve response is not really essential for the operation of a hormone. If one watches a creature such as Amoeba it is clear that this animal senses, ingests, digests and finally absorbs its food by virtue of a mechanism operating in an elaborate succession of stimuli, in which probably many active chemical substances are involved, and all of these substances are being elaborated within the limits of specialisation of what appears to be a single cell, with functions we may judge to be "hormonic". What we call a hormone indeed, need not have to travel far to do its work, and the alternative name "autacoid" was introduced to take care also of those forms of hormonic action which differ from the classical forms of action following transport of an active substance in the blood stream from point of origin to point of action. In 1935 Dr. J. S. Huxley suggested a classification of the hormones or autacoids into four groups, as follows :—

1. **Local autacoids**, which affect the same cell or tissue in which they are formed, as just observed in our reference to Amoeba; such an autacoid, having a fundamental importance, is that present in the fertilized ovum, which leads on to the primary segmentation of that cell.

2. **Diffusion autacoids**, active chemicals distributed by diffusion from cell to cell in multicellular organisms. To this group belong the "auxins," or plant hormones, to which further reference will be made, and the hormones generated in the track of the electrical impulses by means of which stimuli are conducted in nerve fibres.

3. **Circulating hormones**, the typical substances manufactured by the ductless glands and transported by lymph or blood. These include in the human body the secretions of such glands as the pituitary, thyroid, parathyroid, adrenal and sex glands, and most of them are of vital importance.

4. **Parahormones.** These are active chemical substances not necessarily secreted by special glands, but generally by-products of normal or abnormal metabolism. Under this head might be included carbon dioxide, which stimulates respiration, and histamine, which has a protective function in injured capillary tissue, tending to control the amount of blood carried by such capillaries.

Hormones have sometimes been likened, though not perhaps on fundamental grounds, to the vitamins, as we shall observe when dealing with plant growth hormones. Like the vitamins they have very high potency, for solutions of a few parts per million are often effective; also they are frequently (though by no means always, for some are proteins), fairly simple in molecular weight, chemical composition and constitution. Furthermore, they recall the vitamins in that they are *in general* unable to induce the formation of definite anti-bodies, albeit some apparent "anti-hormones" which may appear after free or prolonged administration, provide automatic immunity to their action. Here, while resembling the vitamins, the hormones show a difference in behaviour from the substances characterising blood groups and from the toxins of germ infection. Not only are they generally simpler in their chemistry than the enzymes, but they also differ from the latter in being unchanged when boiled in water or neutral salt solutions; but they are broken down by acids, alkalies and oxidising substances, and most are rapidly destroyed in the blood stream, (though not before they have completed their assigned work), being eventually excreted in a partly decomposed and inactive form. The enzymes of the alimentary tract destroy many of the hormones, which cannot therefore be administered by the mouth. This is the case, for example, with insulin and adrenalin, but it is of interest to note that the hormones of the thyroid gland can be successfully administered by the mouth, and it has been suggested from this that at one stage of evolution the hormones of the thyroid gland were discharged directly into the gullet.

When physiological reactions are observed in tissues and organs there are numerous ways in which it may be established that hormones are actively responsible; indeed some histologists would regard the presence of endocrine glandular tissue as sufficient indication of itself that a hormone is being manufactured there. It was on such a foundation that Schafer, when discussing the islets of Langerhans in the pancreas, (having a typical endocrine glandular structure,) predicted, several years before the isolation of insulin from this tissue, that an active substance was being secreted there. Abnormal changes in the endocrine glands invariably produce *remote* pathological effects. For example, Addison's disease may always be associated with changes observed in the suprarenals, Graves's disease with deficient secretion of the thyroid, and Fröhlich's syndrome, (a group of symptoms which include stunted growth in children and distortions consequent upon abnormal deposition of fat), is always accompanied by changes in the pituitary.

In all these cases benefit can be obtained by the administration of extracts taken from the healthy glands. Furthermore, where there are no symptoms of the diseases named, extirpation of the particular gland or part of the gland, will at once result in an onset of symptoms which in turn can be relieved by administration of an extract or hormone-concentrate prepared from the appropriate gland.

The biochemist furnishes the final proof, for in course of time a technique is developed for the extraction of the hormone in a state of purity. It is then found that injection of this substance into the blood stream produces the anticipated physiological response. Laboratory synthesis of the hormone can only be attempted when its precise composition and molecular structure have been worked out by painstaking organic chemical research; but eventually the laboratory preparation of the pure hormone is achieved and the material becomes a medical specific for dealing with gland deficiency or dysfunction. Such is the record of adrenalin, insulin, the plant auxins, and numerous other hormones.

A vital part is played by the diffusion and circulating hormones in plants and in such animals as have no recognisable differentiation of nervous tissue, and there is a diffusion-like transmission of hormones in nerve fibres during the passage of the electrical impulses typical of communication along such fibres. These facts led Langdon Brown and others to suggest that the transmission of signals and the initiation of responses resulting from the movement of chemical messengers, may represent a primitive system possessed by organisms in general before the evolution of specialised nerve tissue. Certainly this later elaboration of nerve fibres made possible a more rapid, and infinitely more complex, response to stimuli, yet by virtue of its mobility and specific character the chemical hormone still remains, even in the highest organisms, a most reliable and safe messenger; it has become inextricably linked up and applied in the evolution of communication through nervous mechanisms. The vital hormones generated in the cardinal endocrine glands function, in fact, as part of the sympathetic and parasympathetic nervous mechanism; without them there could be no regulation of body temperature or blood pressure, no blood-sugar control, no check on the rate of general metabolism, nor even normal physical and emotional growth from childhood to adult maturity. Put in the most general terms, there is a fundamental link-up shared by the pituitary, thyroid, sex and adrenal glands, through the medium of the sympathetic nervous system; also between the hormone-secreting regions of the pancreas and intestinal mucosa, through the medium of the parasympathetic system. The reader is here referred to the chapters contributed by Drs. Dale, Emmens, Hey and Whittet, in the volume on Hormones published by the Council of the Pharmaceutical Society (1951). This book is obtainable from the library of the B.N.S. Society, and affords much valuable information on the animal hormones, for which space cannot be spared here. As however, it has no word for the plant growth hormones it is proposed to devote the remainder of this article to the latter.

Hormone research in the field of plant growth has found wider practical application in the agriculture of America and some European countries than in Great Britain, but the methods used are often empirical and wanting in precision. The literature on what have been styled "auxins" is spread over a great number of responsible journals, and has been estimated to comprise over 1,500 original papers published in the fifteen years 1935-1950. Growth regulators for stimulating the rooting of cuttings, weed killers to which grass and cereal crops are resistant, "set" improvers for tomatoes and other fruits, some of which encourage fruit development without prior pollination of the flowers,—all of these and many more are to-day well known to agriculturists; their introduction may be said to have begun with the marketing in 1935 of a pure synthetic auxin, indolyl-2-acetic acid.

A suggestion showing remarkable insight was made over 80 years ago by the botanist Sachs, viz., that specific substances might be required by plants for the starting and controlling of growth, a different substance, that is to say, for each different organ. He supposed that these substances could migrate to the region for which they were designed, e.g., for root formation at the base of a cutting, or for inhibition of the growth of side buds while growth proceeded freely at the stem apex under the stimulus of a substance formed there. He expected as a consequence of this hypothesis to find that flowering and fruiting might go on in darkness, if only the active leaves of the plant concerned were kept in the light and so enabled to elaborate the necessary flowering and fruiting chemical agents by photosynthesis.

Sachs's hypothesis of a whole range of growth-affecting substances within a single plant has not been upheld by experimental investigation, but the formation of hormones at growing tips has been established in hundreds of species of plants and is probably universal. The movement of such hormones to regions where they affect growth has been extensively studied, a strong stimulus to investigation having been given by Darwin's results (1880) on *Phalaris* (Canary Grass). He pointed out that the cylindrical sheath, or *coleoptile,* which in seedlings of the grasses protects the shoot during its emergence from the soil, is highly sensitive to light and gravitation, but is actuated only by virtue of a stimulus received at the growing tip and transmitted downwards to the coleoptile. If the coleoptile is illuminated from one side instead of uniformly, or if it be held horizontally, the cells on the dark side in the former case, or on the under side in the latter case, increase greatly in size (but not in number), with the result that the coleoptile bends towards the light or upwards against gravity. All such responses fail if the tip is screened from light (as by fitting an opaque cap over it) or if the coleoptile is decapitated; but simple replacement of a severed tip restores the old sensitivity, provided the tissues are moist (i.e., capable of transmitting a substance in solution). If the tip is restored to a decapitated coleoptile, but out of true centre, growth can take place in complete darkness and preferentially on the side occupied by the tip. The strong presumption that a growth homone is being formed in the tip and transmitted downwards in solution, was confirmed in 1928 by F. W. Went, who placed freshly severed tips of oat coleoptiles on blocks of agar jelly. A hormone substance was found to be adsorbed into the jelly and its concentration could be determined by measuring the amount and rate of curvature produced in a decapitated coleoptile when a known volume of the agar jelly was applied under standard conditions of test. This observation led to a search for the active hormone, culminating in the work of Seubert and Kögl. Growth-promoting substances were isolated from saliva, diastase enzyme, the fungus *Rhizopus* and certain soil bacteria. In 1933 Kögl obtained from urine a pure substance, which also occurs in yeast and somewhat higher fungi and in the growing tips of plants themselves. This "Auxin A" is closely related chemically to a second substance, "Auxin B," which can be extracted from malt or the germ of maize. It was thought that these two auxins were the only significant growth hormones of plants, but much excitement greeted the discovery that the active substance obtained from *Rhizopus* cultures was identical with a growth hormone isolated from urine, entirely distinct chemically from Auxins A and B and familiar to organic chemists since 1885. This was indolyl-2-acetic acid, a concentration of 1 part in 20 million of which in an agar jelly block produces rapid curvature in decapitated shoots in darkness.

These substances are all natural growth hormones and they are distributed through stems, leaves, buds, roots, pollen grains and ovules. A knowledge of their chemical constitution has encouraged chemists to synthesise still more energetic auxins with special properties of interest to agriculturists, such as root stimulation and preferential weed extinction. Application of auxins to unpollinated stigmas has brought seedless fruits (bananas, cucumbers, navel oranges and grape fruits), the technique being successfully extended to beans, tomatoes and strawberries. The destruction of such a plant as charlock by a concentration of napthyl-acetic acid which is easily resisted by oats has been taken as implying that too intense a response to this hormone may result in the development of an anti-hormone, in a sort of protective mechanism against over-stimulation. In this connection it is a familiar experience that if a terminal shoot shows free growth a bushy habit is not obtained from lower buds, which tend to remain quiescent and deficient in auxin until the higher tip is pruned away. A possible antihormone reaction is also regarded as explaining the use of a spray of methyl a-naphthyl acetate at a concentration of 10 parts per million, for preventing potatoes from sprouting in storage, and too early a fall of leaf, petals and fruits. In this way successful marketing of flowers, vegetables and fruits has been materially facilitated.

From the behaviour of plant hormones in certain instances some investigators have judged that the auxins can remain quiescent in a "precursor" form, which changes into the active hormone at a later appropriate period. This has recently been referred to, for example, by Hatcher in the vernalization of rye. If this is truly a feature of the mechanism of the auxins it recalls what is so well known to occur in the case of the enzymes, many of which are formed and stored not in their active state but in preliminary inactive (but related) forms known as zymogens, later to be activated by some other chemical reactant. Indeed a recent view is that the auxins are part of an enzyme system in a fundamental growth process: which again perhaps brings them into line with the vitamins. In this the auxin would require to have a special structure which fitted both the active enzyme fraction and the nutrient substrate. Perhaps the "antiauxins" are near enough in structure to the auxins to allow of a partial but incomplete and unsatisfactory union, as in the case of poisonous substances which cause "blocks" in metabolism.*

Finally, a passing reference may be made to the interesting discovery of English in 1939 that a plant-wound hormone, since called traumatic acid, is liberated by injured tissues of plants as a protective agent. This hormone proceeds to promote the growth of new parenchymatous repair tissue.

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*Cf. Sir R. Peters' Presidential Address (Proceedings Vol. XL p. 48).

The Determination of Zoological Material

By J. H. MURGATROYD, F.L.S., F.Z.S., F.R.E.S.

(*A Lecture delivered on 18th October,* 1951).

The proper determination or naming of specimens (generally referred to as systematics) is the foundation of zoology. No matter what work is being done, whether physiological, ecological or economic, the first essential is the correct determination of the material under consideration, and a sound knowledge of the systematics of his group is essential to every zoologist.

The great Swedish naturalist, Carl Linnaeus, first developed the "binomial" system of nomenclature, whereby each organism is given a scientific name consisting of two words, the first being the generic, or group, name and the second the specific, or exact, name. The International Code requires that, to be valid and recognised, an animal new to science shall be named and described and, if necessary figured. Further, the actual specimens described should, if possible, be preserved as types.

The biological unit is the species. Species are grouped together into genera, genera into families and so on. All these higher groupings are man-made, arbitrary and in a constant state of flux as new knowledge comes to light. The only fixed and stable unit is the species. The members of a species form a reproductively isolated group, whose genes do not combine with those of outsiders, but are able to re-combine continually by sexual reproduction within the group (this definition holds good only for bi-sexual animals). Subspecies, and geographical and other races within the species, are now officially recognised, and necessitate the use of a trinomial system of nomenclature. It is only recently (International Congress of Zoology, Paris, 1948) that the status of these subspecific and infra-subspecific forms has been recognised.

The selection of characters for description which will separate an animal from even its closest relatives requires a ripe judgement and much knowledge and experience of the group to which it belongs, and the decision as to just what constitutes a "specific difference" is frequently a delicate and debatable one.

The characters which it is possible to use vary enormously in different groups. In some, such as certain Orders of the Insecta, a multiplicity of characters is presented, which cannot all be used, and it becomes a question of choosing the most outstanding and easily seen ones, provided they are constant. In other groups so few characters are to be seen that the taxonomic differences between the species are soon exhausted.

The late Sir Arthur Shipley remarked that naturalists could be divided into "lumpers" and "splitters". On the one hand the lumpers are too indulgent of the individual variation within the species, and so are inclined to lump several species together.

On the other hand the splitters decline to make any allowance whatever for individual variation, and so finish up with as many "species" as they have specimens available. The true position, of course, lies between the two extremes. So far, only morphological characters i.e. those which can be seen in the internal or external structure of the animal, have been considered in separating species. The modern view, however, takes into account *all* the characters of the organism, whether morphological or otherwise. Thus cases occur in which we may have two organisms, morphologically exactly alike and inseparable so far as we are able to judge, but which differ materially in habitat or life-history. We have here every justification for separating them into, at any rate, subspecies or races. Much more of this sort of thing will come to light as material is more closely studied in the field.

The determination of a specimen involves the finding of a description to which it corresponds. Dichotomous keys have been constructed for most groups. They consist of a number of couplets, each couplet presenting two conflicting characters from which a selection must be made. The special characters of each species are brought out in these keys so that the work of finding the correct description is much shortened. After determining a specimen by a dichotomous key it is advisable to check against the original description, and against the type specimen.

Much progress has been made during the last century in the writing of original descriptions— the modern descriptions being fuller and clearer, and it has become the practice to append to the description information which will prevent much of the confusion which arose in many of the old descriptions. The reasons for the selection of the name given to the species are stated, thus preventing any future confusion as to its spelling etc. The material from which the description was based, the "type material", is listed and its location given, thus enabling future workers to find, without difficulty, types to which they can refer.

The first specimen described is called the *holotype* and that of the opposite sex the *allotype*. Other specimens, of the same or subsequent batches are, after careful comparison with the types to make sure that they agree, selected as *lectotypes* (Americans call them *paratypes*). These are generally distributed to other institutions so that in case of loss of the types by fire, bombing or other cause, it is possible to fall back upon the lectotypes. Further, this distribution saves zoologists much travelling, for if comparison with a type is required, a lectotype may be found nearer at hand than the holotype or allotype. Type material is treated as if it were gold, and is rarely allowed to leave the building or Institution where deposited.

In many cases owing to loss or decay there is no type material of a species in existence. Much work has been done on recent proposals that *neotypes* (freshly collected specimens which are thought to agree in every way with the original) should be designated where no original type material is in existence, and should be given the full status of types. This problem, fraught with many dangers and pitfalls, is now under consideration by the International Commission.

In the writing of a generic description, latitude must be allowed for the inclusion of further species within the genus. On the other hand, a specific description should be close and narrow enough to preclude the possibility of another species being included in the same description. Unfortunately there has been in recent years a tendency for some workers to scamp the labour of original description by making one description serve. Thus, a new genus, erected for the reception of a new species, may be described as "Characters belonging to the species", or alternatively the species is described as "Characters belonging to the genus". Since it is hardly possible to add further species to a genus so narrowly described, this bad practice must inevitably lead to a considerable increase in the number of monotypic genera.

"That which we call a rose by any other name would smell as sweet", but this does not apply to systematic zoology, where nomenclatorial problems loom large, and form a highly controversial battleground. It is a remarkable fact that zoologists can discuss together, quite amicably, matters relating to the morphology or biology of their subjects, but as soon as a nomenclatorial matter is raised, the fur begins to fly. An animal may be known by several scientific names, but one only can be correct and valid, and the others are synonyms. The correct name to use raises many difficult problems, which are dealt with by an organisation known as The International Commission for Zoological Nomenclature, of which the present able Secretary, Mr. Francis Hemming, is an Englishman. In its early days the Commission established the Law of Priority, i.e. that an animal was to be known by the name given to it by the author of the first valid description, and much argument has centred around the meaning of "valid". Furthermore, in cases where a name which had been in general use for many years was found not to be the first valid name under the rule of Priority, much confusion was caused when it was relegated to the synonymy to conform with the rule. To overcome this, the Commission were authorised, in special cases, to suspend the Law, but in many cases these suspensions have caused further confusion.

The International Commission was formed over fifty years ago, and the critics affirm that after fifty or more years of work, confusion and nomenclatorial instability still persist. During the last half century, however, an enormous number of new genera and species have been named and described, and it is better to think in terms of what *would* have been the present-day chaos and confusion if there had been no such Commission.

The Internal Physical Constitution of the Stars and the Sources of their Energy

By W. P. WINTER, B.Sc.

(*A Lecture delivered before the Society on January 30th,* 1952).

From a multitude of observations four fundamental measurements have been made on the stars, namely, the estimation of their masses, diameters, absolute magnitudes and the temperatures of their radiating surfaces. During the last half century theoretical physicists have laboured to construct from these data a picture of the physical state of a star's interior. The sun, a typical Go star, was, on account of its comparative proximity and the consequent greater accuracy of the above measurements, the first object of this investigation. In the 19th century Poisson found an expression connecting pressures and densities in a fluid sphere whose ultimate particles are held together by mutual gravitation alone. At that time nothing was known regarding solar surface temperatures, and a half century passed before the study of critical temperatures and pressures of gases had convinced Emden, in 1907, that the sun and most of the stars must be regardel as purely gaseous bodies, in spite of the fact that the mean densities in many cases exceed greatly the density of any gas known, within the small range of temperature possible for examination under terrestrial conditions. The sun's constituents are assumed to obey the gas laws suitably corrected for high pressures.

Emden, and Eddington after him, assumed for the sun and stars generally, a state of adiabatic equilibrium, i.e., a state in which the temperature at any point in a star is a simple function of the pressure of the gas, and Eddington deduced from the quantum theory that

$$\frac{\text{gas pressure at centre of star}}{\text{gas pressure at distance R from centre}} = \left\{\frac{\text{temperature at centre of star}}{\text{temperature at distance R from centre}}\right\} \text{raised to the 4th power}$$

Combining this relation with Poisson's law of pressures in a sphere subject to no force save that of mutual gravitation of its parts, the internal temperatures and pressures of stars of known masses and radii are calculable. With the aid of the Emden Tables the computation is rapid and direct, the results depending only on the mass and the radius of the star.

For the purposes of temperature-pressure determination an assumption has to be made regarding the average molecular weights of the star's constituents, as this enters into the famous constant of the gas laws of physics. At the high temperatures involved most atoms have shed some of their electrons, i.e., they are more or less (but not completely) ionised. The mass of the electron can be taken as negligible in comparison with that of the atomic nucleus, whence the following are the "molecular weights" of some atoms when *fully ionised* :—H, 0.5; He, 1.33; O, 1.17; C, 1.91; Fe, 2.07; Au, 2.46.

Eddington regarded hydrogen as constituting 30% of the sun's mass (the possible alternative being about 90% hydrogen) and he assigned considerable importance to the heavier atoms; but Chandrasekar, one of his Cambridge pupils, has convinced most astrophysicists that the value of 90% of hydrogen in the sun is the more probable. And thus while Eddington took 2.1 as the average molecular weight of the gas, the value 1.0 is now preferred. Hence, in place of Eddington's estimate of 40 million degrees Centigrade for the central temperature of the sun, the value of 19 million degrees is now provisionally adopted, the central pressure being 3×10^9 atmospheres and the density in C.G.S. units 76, which, as will be obvious from the above molecular weights, certainly does not represent complete ionisation of the atoms.

By way of comparison, Antares, a "cool giant," having 10 times the sun's mass and 400 times its diameter, has a central temperature of about a million degrees Centigrade and a central pressure of 1,200 atmospheres, while d-Cephei, the typical cepheid variable star, has a central temperature of 3.5 million degrees and a central density of 0.0273.

Eddington also showed that a statistical relation, the "mass-luminosity law," holds between the absolute magnitude of a star and its mass. If the absolute magnitudes are plotted against the logarithms of the masses the points lie on a fairly smooth curve of a parabolic type. Further investigation has shown that this law is a consequence of the Emden law of adiabatic equilibrium above described, which strengthens confidence in the reliability of the results.

Another relationship, due to Seares, is that between the masses of the stars and their "effective" or surface temperatures as determined from spectroscopic observations. If the absolute magnitudes of stars are plotted against their surface temperatures an approximate straight line is found. This line, however, is intersected by another, on which are found many giant stars and a large group of variables known as "cepheids," whose luminosity varies periodically, the periods of variation being from a few hours in some cepheids to three months in others. The modern determinations of star temperatures give approximately the same result, namely, about 20 million degrees C. for all stars on the first line or "main sequence," and varying smaller quantities, 1, 2, 3 or 4 millions degrees C. for those on the "branch" line.

A further factor of great astrophysical importance is the effect of the pressure of light, including in that term all frequencies of electro-magnetic radiation. The existence of this pressure was predicted about 90 years ago by Clerk Maxwell and first measured by Lebedew of Moscow in 1905. Such pressure is an obvious consequence of the quantum theory and its magnitude depends on the fourth power of the temperature of the radiating material, becoming enormous when that material has the high temperatures we have described. The internal pressure at any point in a star consists therefore of the sum of the gas and the radiation pressures, which are together equal to, and balanced by, the gravitational pressure. The more massive the star the greater the proportion the radiation pressure bears to the whole. These proportions have been redetermined by Chandrasekar, who finds that for the sun (a dwarf), having a mass of 2 x 10^{27} tons, the radiation pressure is 15% of the whole, while for an "outsize" giant of 150 times the sun's mass the radiation supplies about 90%. On the other hand in a star of one-tenth the sun's mass, the gas pressure accounts for 99% of the whole. Between these two limits lie practically all the stars whose masses we know with confidence. A star whose mass is above a certain limit would be unstable; below the lower limit it would be invisible at stellar distances.

During the last 15 years much attention has been given to the problem of the source of the enormous heat output of a star, which, if we know its surface temperature and its diameter, can be immediately deduced from Stefan's law of radiation. The older hypotheses of chemical combustion or meteoritic bombardment have been dismissed as totally inadequate, but Maxwell's suggestion that a star may derive some of its heat by contraction, in the course of which gravitational energy may be converted into heat, is certainly *vera causa* for the large cool stars of low density and we may regard most stars as having derived a great part of their heat from their own contraction; but this source fails to account for the heat emitted at the rate of radiation characteristic of the great majority of them. The discovery, about 1900, that salts of radium kept in a thermostat remained at a slightly higher temperature than their surroundings, and the measurements of Strutt and Joly, showing that the heat emitted by the derivatives of radium in the earth's crust was about equal to that radiated, suggested that the heat of the sun and stars might be supplied by atomic processes.

In 1932 Cockcroft and Walton began a series of investigations on the bombardment of the salts of lighter elements by protons (i.e., completely ionised hydrogen), raised to high speeds by a strong electric field. Among these elements were lithium, boron and beryllium. Some lithium atoms "captured" protons and then immediately divided into two atoms of helium; these together have considerably more energy than that of the bombarding proton. Such reactions are termed "exothermic" or "heat emitting," as the heat of a gas is measured by the energy of its constituent molecules. The actual mass of the resulting two helium atoms is slightly less than the sum of the masses of the proton and the lithium atom, the slight mass which vanishes reappearing as energy. If the energy released is E and the vanishing mass M, then $E = Mc^2$, where c is the velocity of light, C.G.S. units being employed in this "Einstein equation." Less energetic are the reactions when boron and an isotope of lithum are subjected to proton bombardment; from boron 3 atoms of helium are produced and from lithium two, one being a lighter isotope of atomic weight 3; both reactions are exothermic.

Now it happens that the central parts of the giant red stars, which are much cooler than the sun, are quite hot enough to produce protons in quantity having velocities as high as those employed by Cockcroft and Walton. If we assume the availability of lithium and boron we can then provisionally assign heat production in the cool red stars to two causes; the shrinkage of these stars and the heat evolved by the three thermo-nuclear reactions:

$$^{7}_{3}\mathrm{Li} + ^{1}_{1}\mathrm{H} = 2\,^{4}_{2}\mathrm{He}; \quad ^{11}_{5}\mathrm{B} + ^{1}_{1}\mathrm{H} = 3\,^{4}_{2}\mathrm{He};$$

$$^{6}_{3}\mathrm{Li} + ^{1}_{1}\mathrm{H} = ^{4}_{2}\mathrm{He} + ^{3}_{2}\mathrm{He}$$

all of which if present and converting light elements into helium, should, it is thought, produce more heat than these stars radiate, thus causing an increase in temperature.

Another important group of stars which are outside the main sequence are known as the "cepheid variables." These are "pulsating" stars, whose radii increase and decrease periodically, as do their luminosities. Their central temperatures vary from 2 million degrees C. for those of long periods to 9 million for those with short periods. At such temperatures, in addition to the reactions postulated above for the red giants, the bombarding protons have energies appropriate to reactions in which isotopes of boron, beryllium and deuterium are the respective targets.

Thus we have for the Cepheids:—

$$^{10}_{5}\mathrm{B} + ^{1}_{1}\mathrm{H} = ^{11}_{6}\mathrm{C} \quad \text{(Short Period)}$$

$$^{9}_{4}\mathrm{Be} + ^{1}_{1}\mathrm{H} = ^{6}_{3}\mathrm{Li} + ^{4}_{2}\mathrm{He} \quad \text{(Medium Period)}$$

$$^{2}_{1}\mathrm{H} + ^{1}_{1}\mathrm{H} = ^{3}_{2}\mathrm{He} \quad \text{(Long Period)}$$

all of which exothermic reactions can supply quantities of heat appropriate to these stars' known radiations, while the protons possess the necessary energy due to the thermal conditions.

None of these thermo-nuclear processes is, however, of sufficient energy to account for the intense radiation from the "main sequence" stars, whose central temperatures are in the neighbourhood of 20 million degrees Centigrade. But in 1938 Dr. Boethe showed that at temperatures of 14 millions Centigrade or above, bombarding protons are sufficiently fast to join the nucleus of carbon, which emits a gamma ray and passes into an isotope of nitrogen (N13); which in turn, by expelling an electron, becomes an isotype of carbon (C13). This on being struck by another proton emits a gamma ray and becomes normal nitrogen (N14); which in turn captures a proton, emits a third gamma ray and becomes an isotope of oxygen (O15). This isotope emits an electron and becomes another isotope of nitrogen (N15); which disintegrates after capturing a proton, producing normal carbon (C12) and helium (He4). Thus the outcome of six nuclear reactions is to give us the carbon atom from which we started, while in place of the four "captured" protons we have a single helium atom, and three gamma rays of great intensity have been ejected. The carbon is in the nature of a "catalyst" and the energies of the three gamma rays are the equivalent of the defect in mass of the helium atom from that of the four protons, i.e., 7×10^{-6} grammes per cycle. The Planck-Einstein equation gives us that the average wave length of the emitted gamma rays is 9.3×10^{-12} cm., having 6 times the energy of Radium C.

A. H. Compton has shown that all electro-magnetic radiation, from gamma to Hertzian waves, is subject on reflection to loss of energy, with increases of wave length, so that the bulk of gamma radiation may be converted into heat within the star, the remainder constituting the heat, light and ultra-violet light which a star emits together with the recently identified Hertzian radiation of the "Radio-stars."

It should be pointed out that there is one type of star to which the above generalisations have no application, viz., the "white dwarfs," which are not on either the "main sequence" or the "branch line" of Searles. These stars have enormous average densities of the order of 50,000 (grams per cubic centimetre). For one recently described from Arizona, a density of much higher order is claimed. The stars do not obey the gas laws and ionisation within them must be approaching completion.

Such is an outline of the picture which the atomic physicists and nuclear chemists have drawn of solar and stellar interiors. The astronomer has contributed little to this development, beyond supplying the fundamental data. The new nuclear science has made enormous strides and has before it an unpredictable future. *"Consummata in brevi explevit tempore multa."*

Obituary

Rev. W. E. LOWTHER.

Wilfred Ellam Lowther, whose death at the age of 61 years occurred on February 26th, 1952, was born in 1891 at Henley-in-Arden, Warwickshire, and received his education first at the Grammar School, Henley-on-Thames and later at the Methodist Theological Training College, Headingley, Leeds. As a Methodist minister he served congregations in many towns, including Plymouth, Swindon, Brecon, Bridgwater, Sherborne, Reading, Jersey C.I., Nottingham and Southampton. Wherever his field of labour his helpfulness and kindly humanity won him the deepest affection. As a chaplain he did splendid work in barracks, asylums and Borstal Institutions, and carried brave responsibilities at Southampton during the worst days of the air raids. Owing to failure in health he was forced to retire to Bournemouth, where he soon attached himself to our Society and was persuaded in 1947 to undertake the duty of Editor, an office he continued to fill until his enforced resignation in 1951.

All Mr. Lowther's friends will be glad to have enjoyed the benefit of his gracious and modest personality.

H.E.C.

Prof. G. D. HALE CARPENTER, M.B.E., D.M., F.L.S., F.Z.S.

Godfrey Douglas Hale Carpenter died at the Radcliffe Infirmary, Oxford, on January 30th, 1953, at the age of 70 years. He was born at Eton on October 26th, 1882, and was first educated at Bradfield College, from whence he proceeded to St. Catherine's College, Oxford, where he read Medicine. As a graduate he passed to St. George's Hospital, London, for special studies in Tropical Medicine. He was a distinguished student of birds, molluscs and (especially) insects. His original researches in tropical entomology and insect-borne diseases led to his spending a considerable period in Uganda and elsewhere in E. Africa, where he made fundamental discoveries in work on the tse-tse fly.

He returned to Oxford, where in 1933 he became Hope Prof. of Zoology (with special emphasis on Entomology), and, along with his friend Sir Edward Poulton, a Fellow of Jesus College. Upon his retirement from active work in the University in 1948 he continued to hold his Chair as Prof. Emeritus.

Prof. Hale Carpenter conferred an honour on our Society by becoming its President for the year 1938-1939. His address on assuming office was entitled: "Mimicry in relation to other forms of protective Coloration," and is one of the outstanding contributions made to the Society's *Proceedings*. He was on the list of members from 1939, was for several years an Honorary Member, and was appointed a Vice President last year.

H.E.C.

Back Numbers and Indexes of the Proceedings

Copies of most volumes of the *Proceedings* since 1908 are available. These back numbers contain much valuable material dealing with the archaeology and natural history of Hants and Dorset. Many of the articles and addresses are well illustrated and contain studies not available elsewhere. Detailed indexes covering all issues of the *Proceedings* since 1903 are available to readers, consisting of (1) a printed index referring to the period 1903-1923, which is on sale (price 1/-), and (2) a card index, kindly compiled by Mr. W. S. Brown, dealing with material published between 1923 and the present number.

Members are cordially invited to make use of these facilities and to apply to the Hon. Sec. or the Hon. Librarian for any further information which they may desire.

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